

BBER
LD

JANUARY, 1943



SPHERON
"C"

CEMENT
INC. BOSTON

Neoprene Latex Type 571 Can Be Used In All Production Processes

NEOPRENE LATEX TYPE 571 can be used to manufacture practically all types of products which are made from natural or other synthetic rubber latices. This type of neoprene latex is available on a commercial scale at this time. It is an alkaline dispersion of neoprene in water. It contains approximately 50% solids by weight, and is a milk white liquid having a specific gravity of 1.10.

Articles may be made from the compounded latex by spraying, dipping, electro-deposition, gelation or other types of molding, and fabrics and other fibrous materials may be spread, coated or impregnated with it.

SUPERIOR PRODUCTS—Neoprene Latex Type 571 may be mixed with compounding ingredients and processed in much the same manner as natural rubber latices. It will be used in the manufacture of critical parts necessary to the war effort. In addition to supplementing available supplies of rubber latex, the neoprene latex makes possible further savings of material by producing products which will have longer life under severe conditions of service.

Although Neoprene Latex Type 571 is somewhat less viscous than rubber latex of the same concentration, it may be readily thickened by the addition of relatively small quantities of various thickening agents. Methyl cellulose seems to be the most effective thickener. Casein, glue, bentonite, and various gums are much less effective thickeners.

DIPPED FILMS—Uncompounded and compounded Latex Type 571 can be made to wet glass and other smooth surfaces well by the incorporation of small quantities of a wetting agent such as AQUAREX SMO. Compounded latices containing such a material deposit smooth films that are somewhat tacky when almost dry but most of the tackiness disappears when the film is entirely dry. Films dried at room temperature are tough, elastic and have good tensile strength. However, as was the case with Neoprene Latex Type 57, vulcanization in air at elevated temperatures of the order of 140°C for 30 to 60 minutes is necessary to develop the optimum physical properties of the composition.

FILLERS—The most suitable filler for general use with Neoprene Latex Type 571 is hard clay. Lithopone which was recommended for use in Neoprene Latex Type 57 slightly re-

tards the rate of cure of Type 571, and, therefore, should be avoided. The physical properties developed in a simple basic Neoprene Latex Type 571 stock containing ten parts by weight of clay in addition to ten parts of zinc oxide, two parts of NEOZONE D, 0.25 parts casein and 0.25 parts AQUAREX D are illustrated in the table below.

In addition to clay other inert fillers such as whiting, blanc fixe, soft carbon black and barytes may be used in Neoprene Latex 571. However, none of these fillers has a reinforcing effect, and their use in increasing quantities results in vulcanizates which exhibit a steady decrease in tensile strength and increase in modulus, permanent set and hardness. Mixes containing semi-reinforcing carbon black have excellent stability but the vulcanizates have lower tensile strength and permanent set and higher modulus, hardness, tear and abrasion resistance than those containing soft carbon black. Reinforcing channel black imparts excellent physical properties to Type 571 vulcanizates, but because of its effect on the stabilization of the mix, its use should generally be restricted to less than ten parts by weight.

VULCANIZED PROPERTIES—Vulcanized films from Neoprene Latex Type 571 compounds are inherently resistant to oils and even after immersion for 48 hours at 100°C in kerosene will retain a large proportion of their original strength. A pure gum stock such as that made from the standard basic formula previously mentioned will have a volume increase of approximately 95% under these conditions. The volume increase of loaded compounds containing fillers and oils will be less. Cured films from neoprene latex compounds containing one to two parts of a good antioxidant such as NEOZONE D are unusually resistant to the deteriorating influences of heat, light, oxygen and ozone. Such films appear to be in a usable condition after exposure for 100 days in the oxygen bomb. (Oxygen at 70°C at 300 psi pressure) or 400 hours in the Fade-O-Meter. The electrical properties of neoprene latex films have not yet been fully determined, but indications are that they will be suitable for use as insulation for low voltage applications. Because of the resistance of neoprene to ozone, aging, oils and flame, the overall quality and life of rubber insulation on wire may be improved by giving it two dips in a neoprene latex composition. The manufacture of a wide variety of products from neoprene latex Type 571 has been investigated, and we are in a position to recommend Type 571 compounds for use in the manufacture of many products using dip processes, gelation molding processes, and various procedures for applying protective coatings. Our Latex Laboratory is at your service, and is awaiting any opportunity to cooperate in solving any problem you may have concerning the use of Neoprene Latex Type 571.

Through the Mill



NEOPRENE LATEX and other water dispersions such as the dispersed latex chemicals and color pastes will freeze if exposed for too long a time to excessively cold temperatures. As freezing usually breaks the dispersion, making the product unsuitable for use, we will ship these products by express throughout the winter months unless the customer signifies his willingness to accept responsibility for any damage that may occur due to freezing in transit.

The following products are included in this category:

Neoprene Latex Type 571
Neoprene Latex Type 60
Dispersed Antox
Dispersed Heliozone
Rubber Monastral Fast Blue
PCD Paste
Rubber Monastral Fast Green
GSD Paste

COMPOUND CARDS are readily smeared and unless protected will soon be so dirty that they are practically useless. Application of a clear lacquer effectively protects compound cards as any soiled spots may be easily removed by wiping with a damp cloth. An excellent protectant is du Pont Gloss Paper Lacquer No. 1395. Inquiries regarding this material should be addressed to:

Finishes Division
Fabrics & Finishes Dept.
E. I. du Pont de Nemours & Co., Inc.
Wilmington, Del.

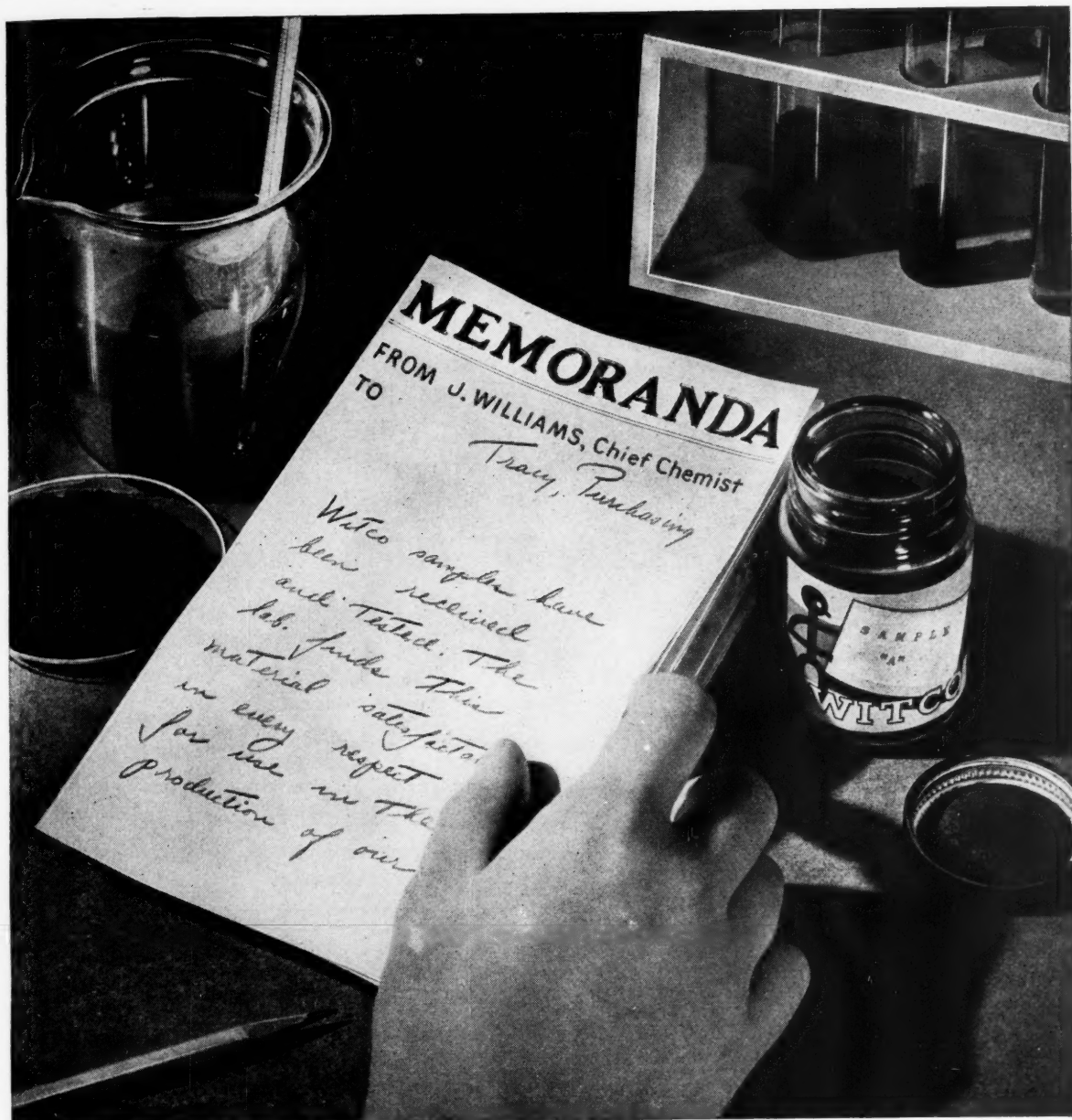
BUNA S Report No. 42-4 entitled, "The Compounding of Buna S" is fresh from the press and is available to the technical staffs of all rubber manufacturers. If you did not receive a copy of this report covering the principles of compounding Buna S, with emphasis on acceleration, ask for a copy on your company letterhead.

PHYSICAL PROPERTIES OF FILMS FROM LATEX 571
BASIC COMPOUND

Air Cure Min./°C	Stress at 600% psi	Tensile Strength psi	Elong. at Break %
0.140	500	3425	990
15.140	825	3850	920
30.140	850	3950	915
60.140	900	4275	910

RUBBER CHEMICALS DIVISION

Wilmington **DU PONT** Delaware



HAVE YOU TRIED WITCO CARBON BLACK No. 12?

Witco Carbon Black No. 12 is the easy-processing black that offers special advantages in the production of heavy-duty tires made with either natural rubber or with reclaim formulations, since it gives an excellent combination of low heat generating qualities in the tire and good wear-resistance in the tread. Sev-

eral leading rubber companies are now using it as a near substitute for furnace type black with highly satisfactory results in tires that must stand up under extreme conditions of service. Witco Carbon Black No. 12 also offers interesting possibilities for use in Buna S formulations. Write today for samples.

WISHNICK-TUMPEER, INC.

MANUFACTURERS AND EXPORTERS

New York, 295 Madison Avenue • Boston, 141 Milk Street • Chicago, Tribune Tower • Cleveland, 616 St. Clair Avenue, N. E. • Witco Affiliates: The Pioneer Asphalt Company • Panhandle Carbon Company
Foreign Office, London, England



AVAILABLE NOW!



PICCO Softeners

FOR NATURAL AND SYNTHETIC RUBBER

The following PICCO Coal Tar Polymers and Resins, having the specific qualities needed for softeners, are available now!

Manufactured under rigid quality control, you can specify PICCO Products with absolute assurance of complete satisfaction.

TYPE	USES
XX-100	for high durometer stocks
420-S	for light colored, intermediate hardness stocks
430	for dark colored, intermediate hardness stocks
Di Polymer Oil	for low durometer stocks

PENNSYLVANIA

INDUSTRIAL CHEMICAL CORPORATION

CLAIRTON, PENNA.

Please refer inquiries to Standard Chemical Co., Akron Savings and Loan Bldg., Akron, Ohio, sole representatives to the rubber industry.

Makers of: Coumarone Resins • Coal Tar Naphthas • Rubber Plasticizers • Reclaiming Oils • Terpene Resins

In 1943 Rely on
Naugatuck Chemical

to supply all of your accelerator requirements for
RUBBER—RECLAIM—SYNTHETIC

Thiazoles

B-J-F
DIESTEREX N
M-B-T
M-B-T-S
O-X-A-F

Xanthates

C-P-B
Z-B-X

Thiurams

MONEX
MORFEX 33
MORFEX 55
PENTEX
PENTEX FLOUR

Activators

D-B-A
DELAC A
DELAC O
DELAC P

Dithiocarbamates

ARAZATE
BUTAZATE
ETHAZATE
METHAZATE
PIPAZATE
SAFEX

Aldehyde Amines

BEUTENE
HEPTEEN
HEPTEEN BASE
TRIMENE
TRIMENE BASE

PROCESS—ACCELERATE—PROTECT with Naugatuck Chemicals

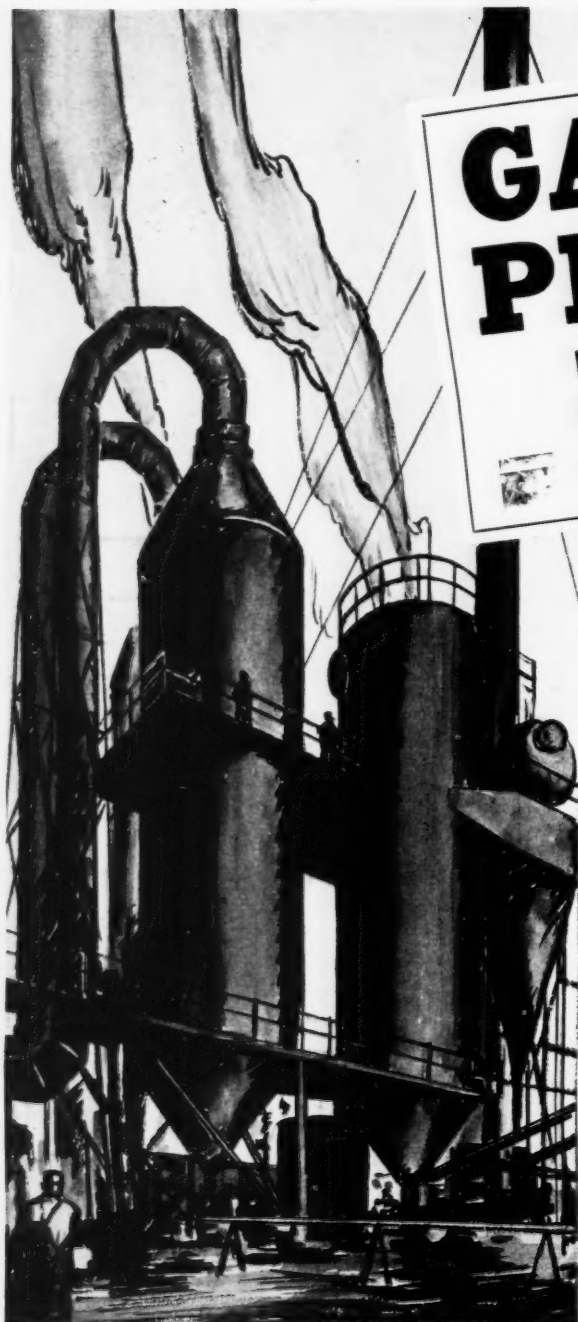
Naugatuck Chemical

DIVISION OF UNITED
ROCKEFELLER CENTER



STATES RUBBER COMPANY
NEW YORK, N. Y.

IN CANADA: Naugatuck Chemicals Limited, Elmira, Ont.



GASTEX & PELLETEX

REENFORCING BLACKS
Go "ALL OUT"
for VICTORY

GASTEX and PELLETEX are so vital to our war effort in rubber conservation, reclaims, and the compounding of synthetics that our entire output has been placed on allocation under WPB Order M-244. Shipments can be made only on specific Government license for each individual order.

There's no rationing or regulation of service and friendship, however. So, in extending to you the season's greetings, we offer our continued close cooperation in your development plans, with the belief that when the war and peace have been won, you will find many new and expanded uses for our products.

HERRON BROS. & MEYER

OHIO BLDG., AKRON, OHIO.

GENERAL SALES AGENTS FOR

GENERAL ATLAS CARBON DIVISION

OF GENERAL PROPERTIES COMPANY, INC.

PAMPA, TEXAS — GUYMON, OKLA.



DISTRICT SALES AGENTS

ERNEST JACOBY & CO., Boston

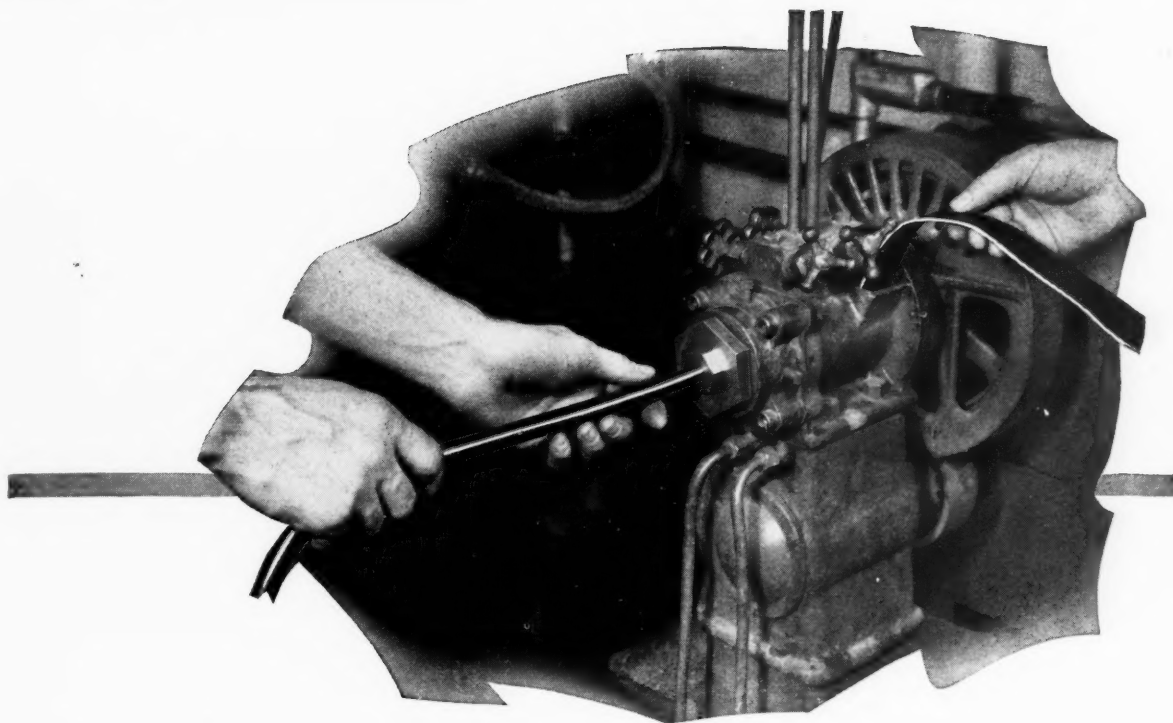
HERRON BROS. & MEYER, New York

THE C. P. HALL CO. OF CALIF., Los Angeles

HERRON & MEYER, Chicago

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ST. LAWRENCE CHEMICAL CO., LTD., Toronto - Montreal



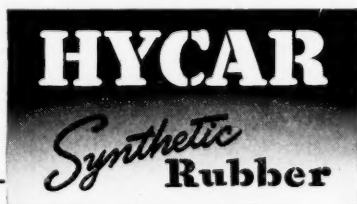
Did somebody want a synthetic that *tubes*?

To rubber fabricators who have been having difficulty tubing synthetics, this is an important picture. It shows a piece of Hycar, aircraft specification stock, being tubed on a test extruder in our Customer Service laboratory.

Of course, to the many who are well aware of Hycar's excellent tubing qualities, this is old stuff. They know from experience the fine, smooth finish and the fast rate of extrusion obtainable with Hycar.

To them this is a reminder, however, that significant new developments are coming from this laboratory every day; that, for example, tubing stocks of 40 Durometer hardness for cures in open steam are now out of the lab and in production.

To others this is an invitation to make full use of our complete, up-to-the-minute facilities and staff in solving problems and perfecting products of synthetic rubber.



HYCAR CHEMICAL COMPANY, Akron, Ohio

LARGEST INDEPENDENT PRODUCER IN AMERICA OF BUTADIENE SYNTHETIC RUBBER

Utility replaces beauty



...in the
TITANOX *program*

JUST as TITANOX pigments give whiteness and brightness to natural and reclaimed rubber, so they do to synthetics.

However, utility is now the keynote of the National Rubber Program. In cooperation, the entire efforts of the TITANOX Rubber Laboratory are devoted to the development of superior physical

properties of synthetic rubber.

We will gladly join forces with technical men in the tire and rubber fields in this work whether or not TITANOX pigments are involved.

TITANIUM PIGMENT CORPORATION
SOLE SALES AGENT

111 B'way, New York, N. Y. • 104 South Michigan Avenue, Chicago, Illinois • 350 Townsend Street, San Francisco, California • 2472 Enterprise Street, Los Angeles, Calif.



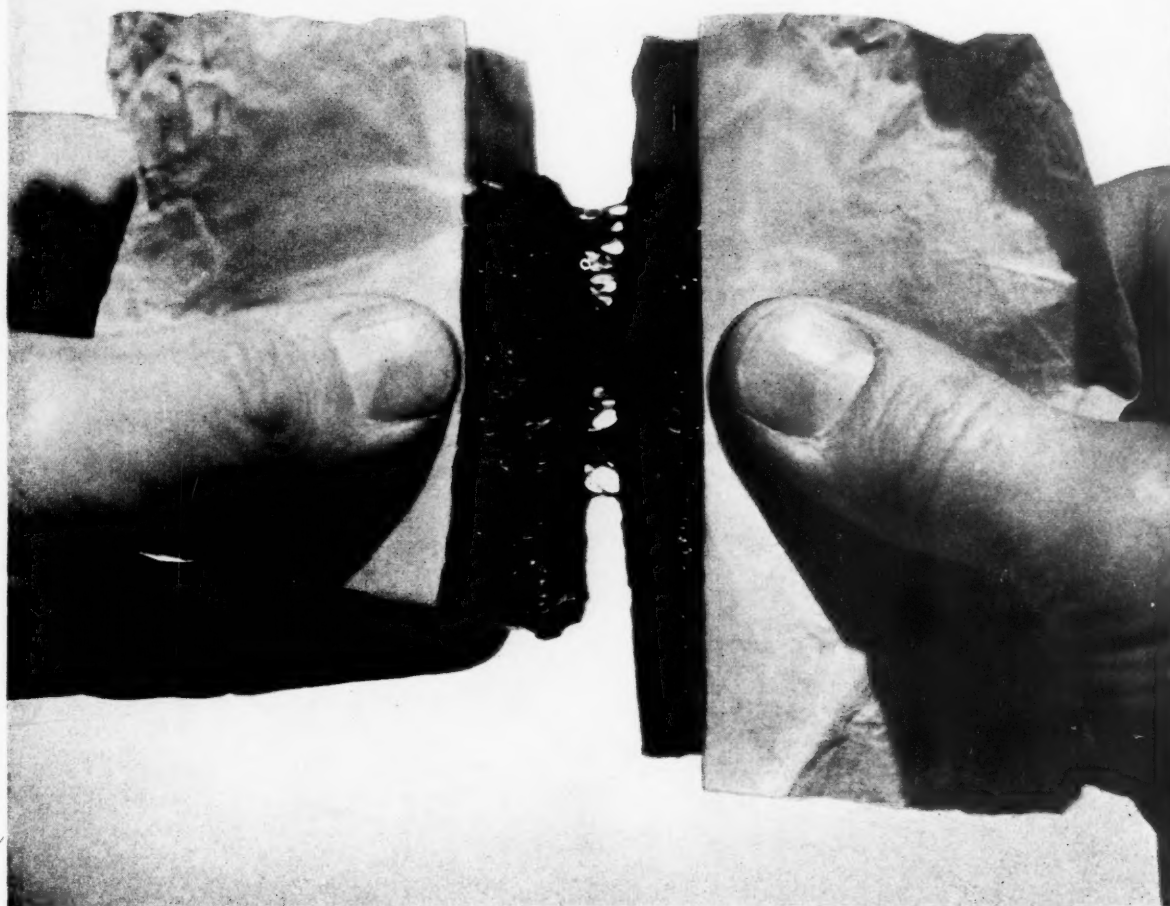
TITANOX

TRADE MARK

NAFTOLEN^{*}

*REG. U. S. PAT. OFFICE

the TACKIFIER *for Buna S*



- To obtain tacky and easy-processing Buna S stocks, use NAFTOLEN in proportions of 20% or higher in your formulations. Because NAFTOLEN co-vulcanizes with Buna S, the use of large proportions will not impair the physical properties of the vulcanizates.

WILMINGTON CHEMICAL CORPORATION

10 East 40th Street · New York, N. Y.

Plant and Laboratory: Wilmington, Delaware





Tensile strength

Resistance to aging

Dielectric strength

Write Our Technical Service Dept. for Details.

MOORE & MUNGER

33 RECTOR STREET - NEW YORK CITY



PREPARED FOR THE STRAIN OF TOMORROW

KOSMOBILE DIXIEDENSED

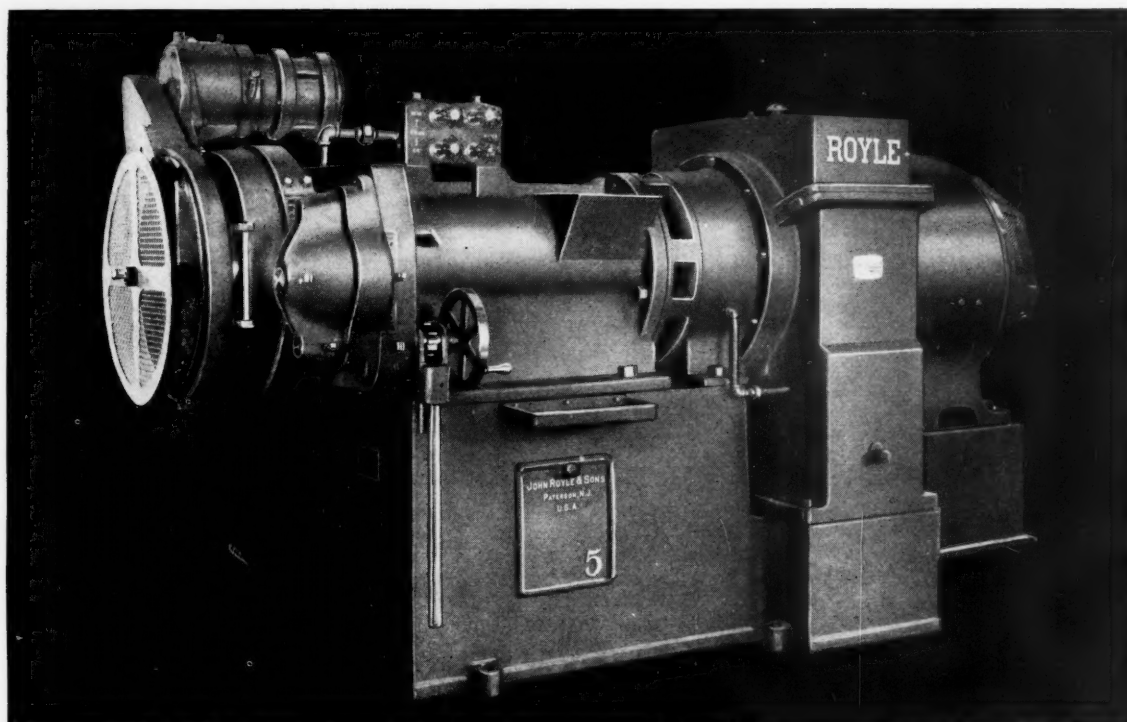
DUSTLESS CARBON BLACKS

UNITED CARBON COMPANY - CHARLESTON, WEST VIRGINIA

KOSMOBILE AND DIXIEDENSED HAVE COME BY
THEIR REPUTATION HONESTLY. THEIR USE IN
YOUR COMPOUNDS MEANS PRODUCTS WELL
PREPARED FOR THE STRAIN OF TOMORROW.



TIMES *have* CHANGED



8 1/2 INCH EXPANSION TYPE GATE-HEAD STRAINER WITH MANUALLY-OPERATED LOCKING DEVICE.



Since Grandpa was a boy, a great many changes have been made. The "Spreading Chestnut" has branched out and "the village smithy" now owns two garages and a string of filling stations.

Likewise America has changed. Yester-

day she was trudging along like Grandpa. Today, she has taken wings, lifting herself from the doldrums in a tremendous national effort.

There is one thing that has not changed—the high regard we hold for our customers remains the same. Until conditions become stabilized, John Royle & Sons pledges equitable attention with maximum speed to every obligation.



John Royle & Sons *Since*

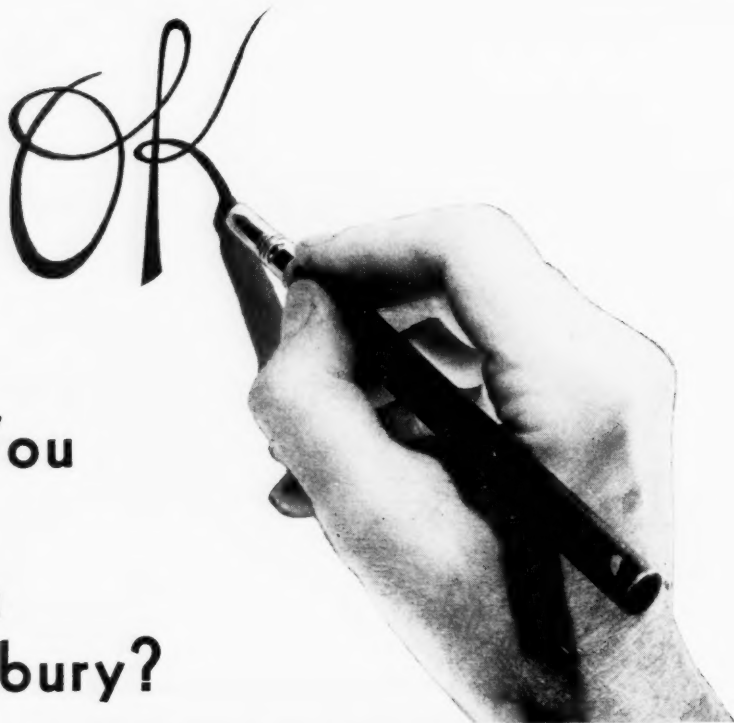
1855

AKRON, J. C. CLINEFELTER •

• LONDON, JAMES DAY (MACHINERY) LTD.



ROYLE'S **62** ND. YEAR OF EXTRUDING MACHINE MANUFACTURE



Would You Put This Mark On Your Banbury?

Your Banbury's big task lies ahead . . . The demands of production will be an exacting master, taking its toll of wear. We have built up the resistance of hundreds of Banburys to meet strenuous compounding requirements—redesigned and rebuilt many to do their part more efficiently in the VICTORY program . . . **WILL YOURS DO THEIR PART?** We have specialized for years on Banbury rebuilding. We have the skill, born of experience, to make your Banburys meet the tough demands of production—and meet them with assurance of speed and economy. When we rebuild your Banbury you can put the "O K" on it with confidence.

*If your Banbury is worn, contact us
at once for a rebuilding schedule.
This will avoid long tie-up of equipment.*



INTERSTATE WELDING SERVICE

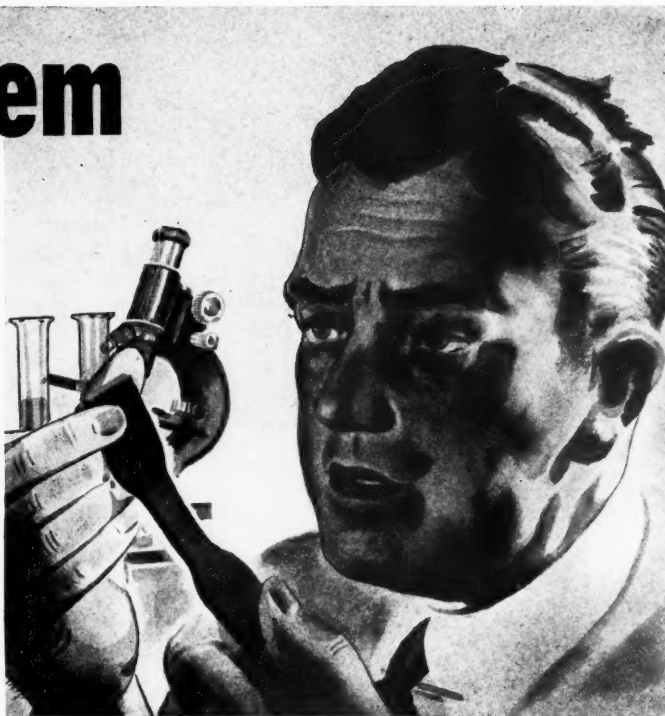
Main Plant: 914 Miami Street . . . AKRON, OHIO . . . Phone: JE 7970
EXCLUSIVE SPECIALISTS IN BANBURY MIXER REBUILDING

The Problem

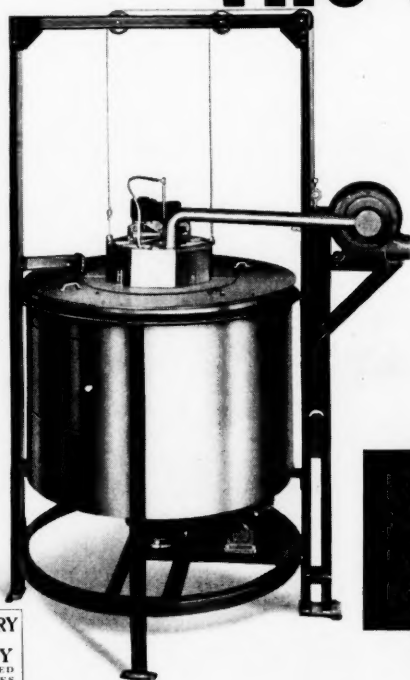
To Obtain Maximum Utility
from Every Pound of our
Supply and Production of

Natural Rubber
Synthetic Rubber
Reclaimed Rubber

● To conserve our supply of natural rubber, synthetic rubber, and reclaimed rubber, it is essential that every pound available be applied where its particular characteristics can be best utilized. Accelerated light aging tests are a valuable means of determining the durability characteristics of experimental and finished products under service conditions.



The Solution



● The "National" Model X-1-A Accelerated Weathering Unit is the solution to the problem of light aging. It produces results which are closely correlated with those obtained under natural conditions, but requires only a fraction of the time. Results obtained in the unit are reproducible and are not affected by such variables as weather, season and location.

The "National" X-1-A unit light ages synthetic rubbers, natural rubbers, and reclaimed rubbers accurately and quickly. The machine is included in consumer specifications, and manufacturers are using it for testing the light aging resistance of new formulations and finished products designed to meet these specifications.

Procurable on priority rating in accordance with regulations in effect at time order is placed.

THE NATIONAL MODEL X-1-A
TRADE-MARK
ACCELERATED WEATHERING UNIT
WRITE FOR DESCRIPTIVE BULLETIN

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation

CARBON SALES DIVISION, CLEVELAND, OHIO
General Offices: 30 East 42nd St., New York, N. Y.

Branch Sales Offices: New York, Pittsburgh, Chicago, St. Louis, San Francisco





**RUBBER
★
SYNTHETIC RUBBER
★
PLASTICS**

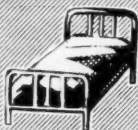
**THE Schuster
MAGNETIC CALENDER GAUGE
SAVES THAT MATERIAL**

For upwards of 15 years, the Schuster Magnetic Calender Gauge has unerringly set rubber calender rolls to a predetermined thickness and correctly maintained that thickness. It has saved the time of hand-miking, eliminated human error, saved the stock sampled for calender tests, and assured uniform thickness in the finished product.

All this, *at the right time*—before damage is done. And *continuously*—the only way worth while.

The instrument is simple in design . . . rugged in construction . . . practically without wearing parts . . . adjustable to any thickness. Originally used for rubber, it has taken over just as deftly for synthetic rubber, plastics, cellulose, and other media. No matter what the article, your coating must be thick enough, but not even 1/1000" too thick, or the war effort suffers irreparable loss. No matter what the material, you've got to s-t-r-e-t-c-h it as far as possible—and "possible" daily proves to have a new, elastic meaning.

Better investigate the Schuster Magnetic Calender Gauge at once, with or without automatic control. Every installation has to be engineered to the job . . . Please give us time to do it right.



Ask for our bulletin on the Schuster Magnetic Gauge.

THE MAGNETIC GAUGE COMPANY
60 EAST BARTGES STREET AKRON, OHIO
Eastern States Representative—
BLACK ROCK MANUFACTURING CO., Bridgeport, Conn.

*Improve
the tack*
WITH

CRYSTEX
insoluble
SULPHUR

Crystex, an amorphous sulphur, improves the tack by preventing bin-cure and dryness which usually occur when a high percentage reclaim compound is used.

Crystex prevents bloom in uncured rubber stocks. It does not dissolve in rubber but will "stay put" at temperatures usually prevailing during storage periods. Crystex is of outstanding value when employed in the manufacture of stocks to be used for repair materials, in retread stocks, valve-patch frictions, and other products.

The characteristics of Crystex indicate that further uses may be found for this product in the rubber making industry.

OTHER RUBBERMAKERS' CHEMICALS

Commercial Rubbermakers' Sulphur, Tire Brand,
99 1/2% Pure

Refined Rubbermakers' Sulphur, Tube Brand,
100% Pure

Carbon Tetrachloride, Carbon Bisulphide
Caustic Soda, Sulphur Chloride



STAUFFER CHEMICAL CO.

420 LEXINGTON AVE., NEW YORK, N. Y.

230 NO. MICH. AVE., CHICAGO, ILL.

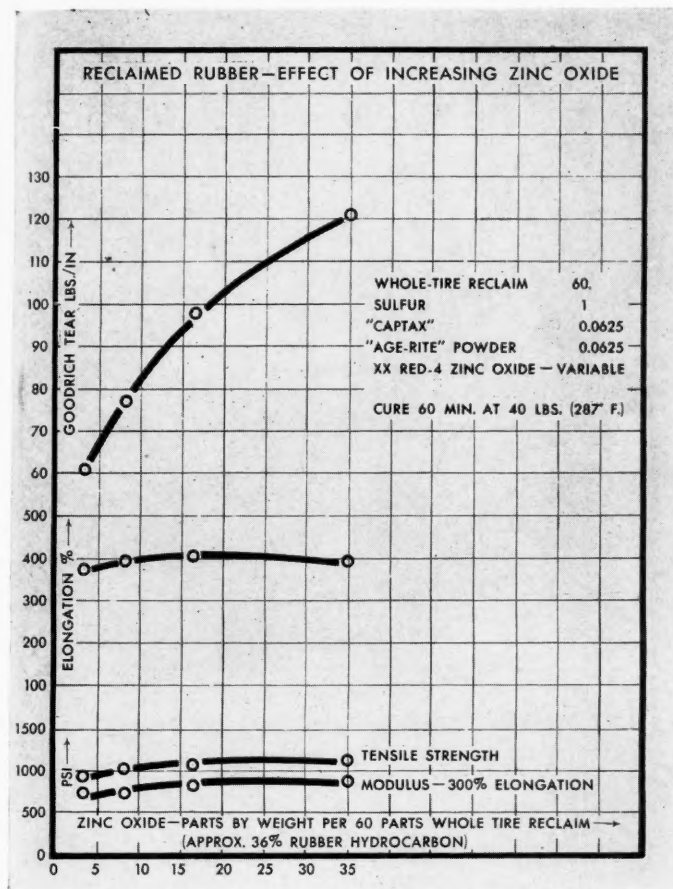
624 CALIFORNIA ST., SAN FRANCISCO, CAL.

555 SO. FLOWER ST., LOS ANGELES, CAL.

424 OHIO BUILDING, AKRON, OHIO

NORTH PORTLAND, OREGON

HOUSTON, TEXAS, APOPKA, FLORIDA



Improve Reclaim Compounds with Increased Amounts of Zinc Oxide

It has been quite generally recognized that improved physical properties result from the addition of zinc oxide to compounds containing reclaimed rubber, irrespective of the amount of residual zinc oxide present in the reclaim.

This fact is of current interest due to the rubber conservation program and the necessity of using all-reclaim or high proportions of reclaim in many important but less critical compounds.

The improved physical properties—Tensile Strength, Tear Resistance, etc.—are accompanied by improvement in processing characteristics.

These effects were first brought out in a comprehensive study by Winkelmann and Croakman, published in *"Industrial and Engineering Chemistry,"* Volume 20, Page 134 in 1928.



THE NEW JERSEY ZINC COMPANY • 160 FRONT STREET, NEW YORK

UNIFORM QUALITY ZINC OXIDES • • THE HORSE HEAD BRANDS

Baruch Committee Recommends GROUND SCRAP

11. The Committee also suggests the introduction into the manufacture of "camelback" for the retreading of civilian tires, the practice of adding up to 20 percent of finely ground tire treads into all reclaimed rubber tread stocks. This practice will improve the wearing qualities of the reclaimed rubber required for their production.

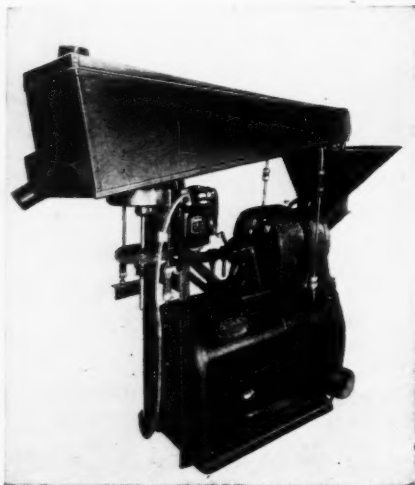
*Extract from the Baruch
Committee Report, Sept. 10,
1942.*

Ground Scrap is also suitable for use in the manufacture of any molded rubber articles.

SPAN GRINDING MILL

Reduces all grades of vulcanized rubber scrap to fine powder form ready to be mixed with ordinary molding compounds.

Provided with an attached vibrating screen, the latest model SPAN GRINDING MILL (Type VIII) is a compact, self-contained unit producing a uniform material automatically and at low cost. Capacity 200 to 400 lbs. per hour. Power required, 25 H.P.



You can help conserve essential rubber by using the Span Grinding Mill — Send for full information.

M. PANCORBO
155 JOHN STREET, NEW YORK, N. Y.

CAN WE HELP YOU SOLVE ANY OF THESE WAR-TIME CHEMICAL PROBLEMS?

- ★ Have you "idle" inventories of chemicals which should now be used by some other manufacturer for war materials?
- ★ Are you having trouble locating essential chemicals in order to fill your war requirements?
- ★ Do you require an established chemical organization to act as intermediary for you in buying chemical products in the open market?

... If so, Golwynne Chemicals Corporation, a firm of many years standing among chemical houses, is equipped to render you a most complete chemical service ... covering direct purchase or sale of products, or the location of buyers or sellers, to suit your requirements.

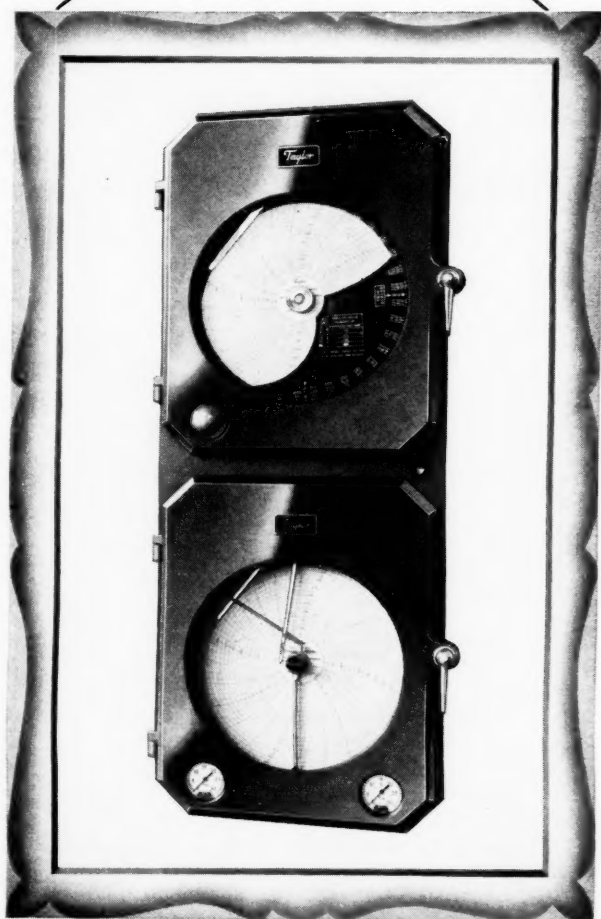
Write, wire or telephone your problem today to Dept. 20

GOLWYNNE
CHEMICALS CORPORATION

420 LEXINGTON AVENUE • NEW YORK, N. Y.
LEXINGTON 2-9740

WHY AREN'T THERE
ANY PEOPLE
IN THIS PICTURE?

BECAUSE TAYLOR
TIME SCHEDULE
CONTROLLER
ELIMINATES THE
HUMAN ELEMENT!



Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

THIS instrument takes the guess work out of almost any batch process-control problem!

If the distinctive flavor, color, potency, texture, or other physical characteristics of your product are dependent on following an intricate time-temperature or time-pressure schedule, you can't rely on manual control or personal judgment of new operators. But you can rely *absolutely* on the Taylor Fulscope Time Schedule Controller!

Once any ideal schedule has been determined, the cam can be cut to coincide with it precisely, and the same schedule reproduced exactly.

With skilled labor and materials so hard to get, the Taylor Time Schedule Controller is the instrument you need to avoid waste and budget the operator's time most effectively.

PUSH BUTTON CONTROL entirely eliminates manual re-setting of cam at start of cycle.

ADDITION OF INTERRUPTER TIMER permits extreme flexibility of rise, hold, or fall periods in time schedule with the same cam.

DUAL CASE CONSTRUCTION permits easy accessibility to both control mechanism and cam and trip mechanisms.

NUMEROUS AUXILIARY FUNCTIONS can be easily and precisely synchronized with the progress of the processing schedule.

DOUBLE-DUTY form also available for control of two related temperatures, pressures, or flows.

If you haven't already seen this outstanding new Taylor development, get the full story from your Taylor Field Engineer.

Taylor Instruments

— MEAN —

ACCURACY FIRST

IN HOME AND INDUSTRY

MONOBAND SYSTEM

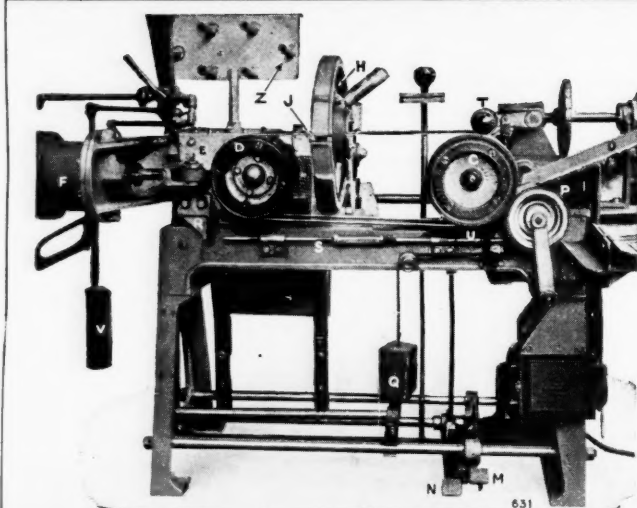
The "Monoband" System embodies the latest developments for making wired-on cycle tyres. This process reduces labour costs to a minimum.

The "Monoband" machine with Tread Feed builds the foundation of the tyre and applies the rubber covering, com-

pleting the whole tyre at one operation with a production of from 60-90 complete covers per hour.



CYCLE TYRE PLANT



FRANCIS SHAW & CO. LTD., MANCHESTER, 11, ENGLAND

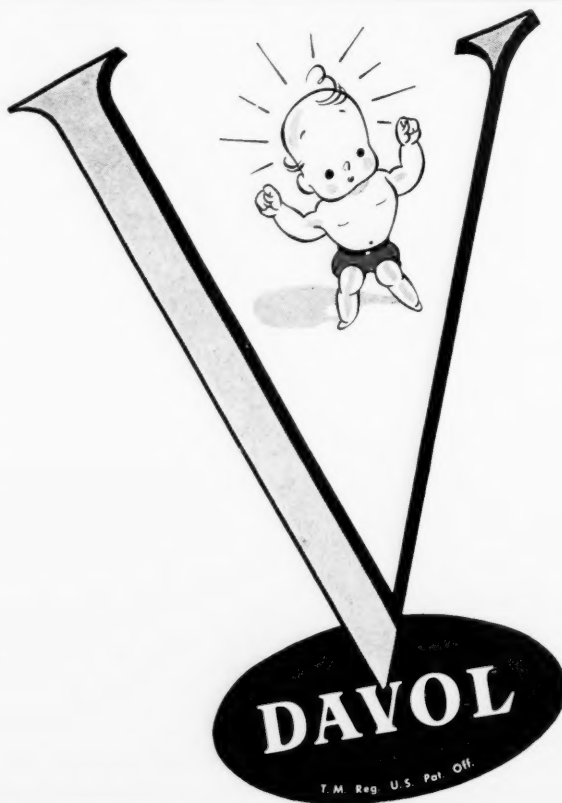
FIT TO FIGHT!

To win this war, we've got to keep strong and husky and well—all of us must. This is why Uncle Sam puts health needs on a par with war needs. Rubber is being conserved in every possible way, but the health of our people is not being forgotten.

To help save rubber, the Davol line of sundries has been simplified—so that there may continue to be an adequate supply of the essential items.

... And today, "know how" in compounding counts more than ever!

DAVOL RUBBER COMPANY
PROVIDENCE RHODE ISLAND



CHANGE OVER TO

Continental "AA" CARBON BLACK

FOR LESS HEAT GENERATION
IN ALL TIRE FORMULATIONS

IT'S EASIER PROCESSING, TOO—



TRY IT IN YOUR BUNA S FORMULATIONS

Continental "AA" is already being successfully used in the Buna S formulations of leading manufacturers. Now is the time to investigate the characteristics of this new type black. Our Technical Staff will gladly work with you in adapting Continental "AA" to your particular requirements. May we send you samples for your experiments?

ONE OF THESE GRADES IS YOUR BLACK

CONTINENTAL "AA"—Low heat generating—easy processing

CONTINENTAL A—Medium cure—medium processing

CONTINENTAL C—Standard

CONTINENTAL F—Slow cure—hard processing

CONTINENTAL C-15—Low conductivity




Continental

CARBON COMPANY

295 MADISON AVENUE • NEW YORK, N. Y.

Akron Sales Office: Peoples Bank Building, Akron, Ohio • SALES REPRESENTATIVES:
Ernest Jacoby & Co., Boston, Mass. • Marshall Dill, Los Angeles and San Francisco, Calif.



A Bright Omen FOR 1943

*When American troops landed in Africa in November,
a magnificent rainbow arched the sky.*

SEASON'S GREETINGS

To our many friends we extend
the season's greetings and
sincere wishes of good cheer.
It is our hope and prayer
that under the guidance of
Divine Providence, victory may
soon bring true and lasting
peace to our beloved country.

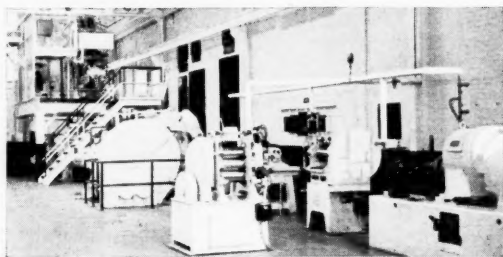
HERMAN MUEHLSTEIN
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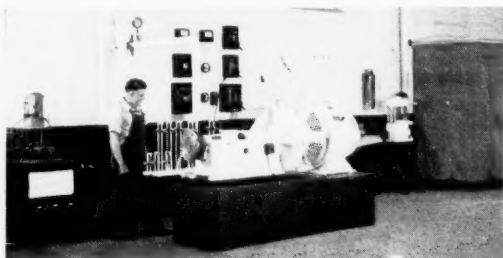
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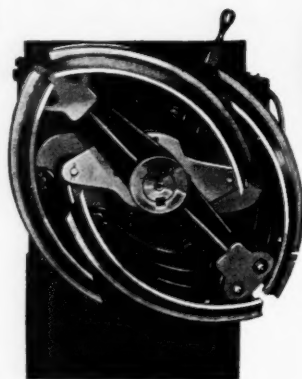
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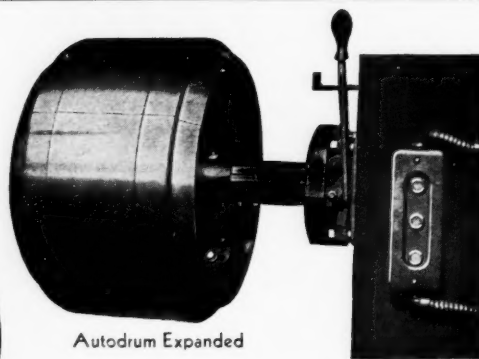
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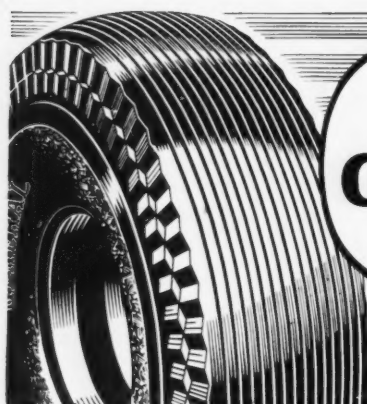
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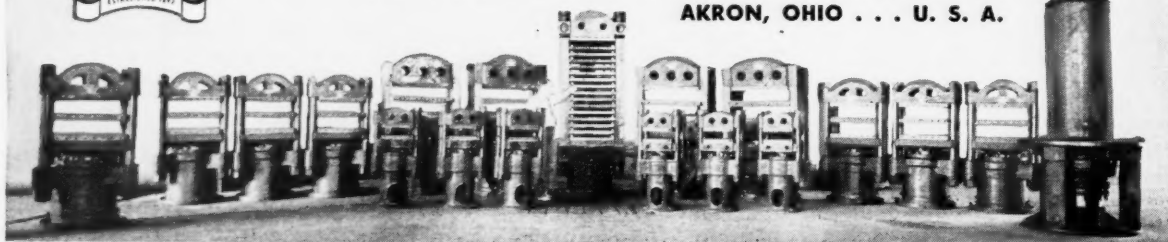
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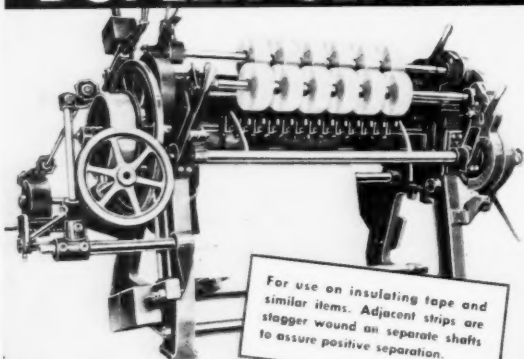
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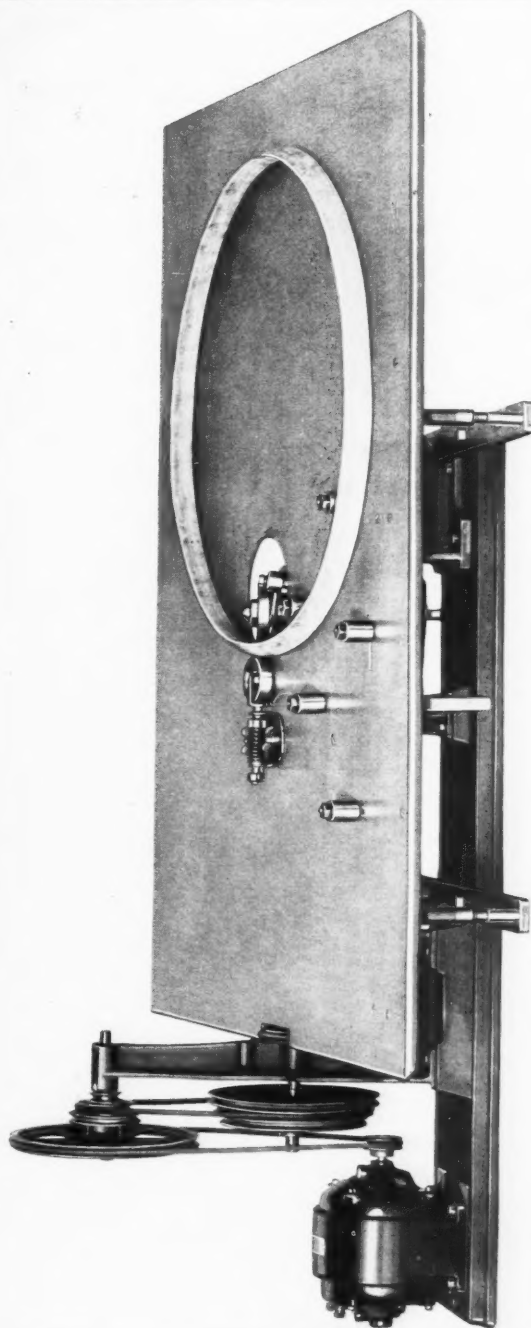
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VOLUME 107

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Volume 107

New York, January, 1943

Number 4

The Role of Zinc Oxide in Compounding Government Synthetic Rubber

R. S. Havenhill¹ and J. J. Rankin²

THE nation's crude rubber supply is diminishing at such a rapid rate that the construction of large heavy-duty high-speed tires of 100% synthetic rubber for the Army and Navy is of paramount importance. Past experience in natural rubber with solid tires and bus balloon tires containing high loadings of zinc oxide would indicate the value of zinc oxide for this type of service. Because of the much higher heat generation during flexing of the butadiene-styrene copolymer rubber as compared with natural rubber, the role of zinc oxide in producing cool running GR-S treads and carcasses should be of greater importance than ever. This would not be the case, however, if the decision were to be based on laboratory flexometer tests as run in the past. It is the purpose of this work to point out why laboratory flexometers have failed in this respect and to describe a modified type of flexometer test using the St. Joseph Lead Co.'s machine,³ (see Figure 1) which, we feel, should more nearly duplicate road tests on this type of compound, also to present data, using this type of test, which indicate that mixtures of channel black with zinc oxide give higher tensile strength and cooler running stocks than those containing soft blacks or mixtures of soft blacks with channel blacks.

Road vs. Laboratory Flexometer Tests

The crux of the situation lies in the fact that the service conditions of a tire are such that the heat conductivity of the stock aids in the dissipation of heat which is generated. That is, the greater the thermal conductivity of the stock, the lower the running temperature. This is especially true of the tread compound and, to a lesser extent, the carcass whose generated heat must be conducted through itself, the tread, and sidewalls. In the laboratory flexometer the testing conditions are such that the thermal conductivity and diffusivity of the sample play a minor role in dissipating the heat generated. This condition is brought about by the fact that the laboratory sample is thick in relation to the area exposed for radiation cooling [less than $\frac{1}{5.56}$ that of a tire (see Appendix 1-c)] and, furthermore, by the fact that it is tested between insulated

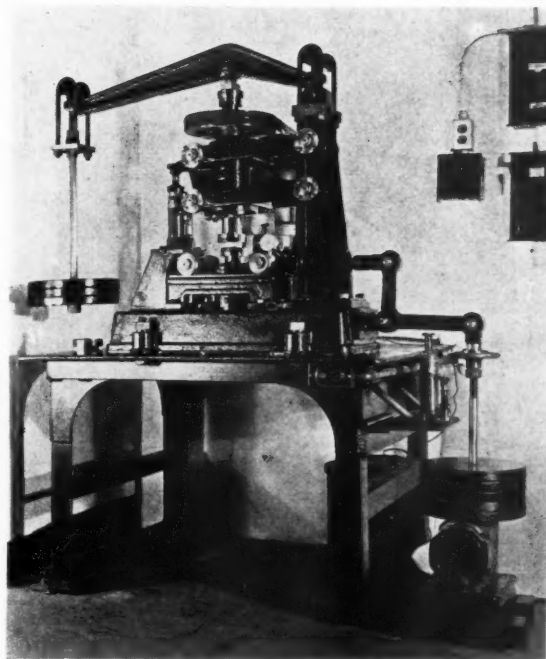


Fig. 1. St. Joseph Lead Co.'s Flexometer

face plates such as wood, hard rubber, or micarta, and there is little or no chance for heat dissipation. Other factors of equal importance are high peripheral speed of the tire (35 m.p.h. if the car is traveling 35 m.p.h.) as compared to the laboratory test specimen of 3.9 m.p.h. peripheral speed (see Appendix 2-b), and the fact that a tire on a car traveling 35 m.p.h. is not only rotating around the axle, but is moving horizontally through the air with a 35 m.p.h. speed which is the equivalent of a 35 m.p.h. cooling wind, neglecting tread wind drag, blowing across it.

One other fact which tends to confirm the conclusion that the laboratory flexometer, as normally run with thermally insulated face plates, measures mainly the heat generation is that the work done on the sample is only slightly greater than that calculated from thermal data to bring the sample up to the temperature attained during test. This would indicate that most of the work done on

¹ Research chemist, in charge, rubber laboratory, St. Joseph Lead Co., Monaca, Pa.

² Production engineer, St. Joseph Lead Co., Monaca, Pa.

³ INDIA RUBBER WORLD, Nov., 1934, p. 48. A.S.T.M. D 623-41T.

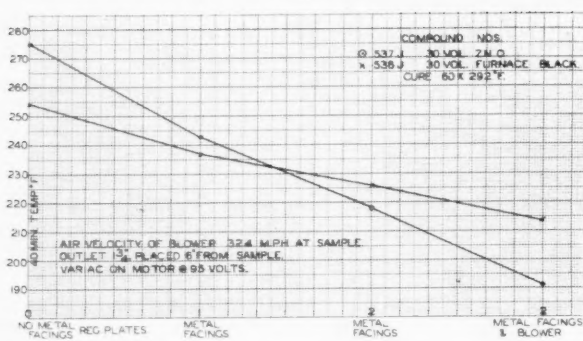


Fig. 2. The Effect of Heat Conductivity of Pigment on Temperature Developed in Sample and the Effect of Conditions of Heat Radiation on Temperature Developed in Sample. Comparison of Zinc Oxide and S.R. Furnace Black with Different-Type Face Plates

the sample was converted to heat. Very little of this was lost during a test.

Development of New Test Method

In order to bring into the flexometer test the effect of thermal conductivity of the stock so as to simulate more nearly road test, it was felt that the ratio of radiating surface to thickness of the sample must be increased to be more nearly that of a tire and allow more heat flow. Consequently tests were run in which $\frac{1}{4}$ -inch of the bakelite face plate of the flexometer was removed and replaced with a $\frac{1}{4}$ -inch steel plate. Comparative tests were then run between a semi-reinforcing furnace black⁴ stock and a high zinc oxide stock. For these tests compound E 1037 (see below), which contained 30 volumes of required pigment on 100 parts by weight of GR-S (Buna S) was used. Cure was 60 minutes at 292° F. for compounds 537 J (zinc oxide) and 538 J (S.R. furnace black).

E 1037 BASIC	
	Parts by Wt.
Buna S	100
Sulphur	2.5
Captax	1.5
Zinc Oxide	5.0
Stearic Acid	2.5
B.R.T. #7	1.0
* Pigment	30 Vol.

* Parts by weight of pigment = 30 ÷ sp. gr. of pigment.

The results were so surprising that further tests were run, using $\frac{1}{4}$ -inch metal plates on both face plates. A high-speed blower was then installed so as to blow cooling air past the sample. The air velocity was adjusted to 32.4 m.p.h., using a Variac to vary the blower speed and a Velometer to measure the air velocity at the sample. In all these tests standard cylindrical test specimens $1\frac{1}{2}$ inches in diameter and $1\frac{1}{2}$ inches in height were run with a vertical load of 485 pounds and a horizontal deflection of 0.130-inch. The temperature at the center of the test specimen was measured with a hypo needle thermocouple at the end of 40 minutes of test. This 40-minute temperature was taken as the criterion for evaluating the cool running properties of the stocks. In Figure 2 the 40-minute temperature values have been plotted for a 30-volume S.R. furnace black stock and a 30-volume zinc oxide stock, using the regular bakelite insulating plates, one $\frac{1}{4}$ -inch metal faced lower plate, two $\frac{1}{4}$ -inch metal faced plates, and two $\frac{1}{4}$ -inch metal faced plates with the blower. The results are self-explanatory and show that, using the insulating plates such as are used in the ordinary flexometer test, the S.R. furnace black generates less

heat than zinc oxide. When the two metal faced plates are used, however, the zinc oxide stock is cooler running than the S.R. furnace black stock, and with the addition of the blower, the zinc oxide stock is considerably cooler (23° F.) than the S.R. furnace black compound.

While we do not know the exact point on this graph (Figure 2) where tire road tests would fall, we do feel, after a careful consideration of all known factors involved, that it would be toward the right side of the graph. Consequently further tests shown in this paper were run using the two metal face plates and no blower. (Figures 3, 4, 5, and 6.) It might be pointed out here that these tests indicate that, if high heat conductive pigments are used in tread and carcass, and proper attention to tire design is given (so as to take advantage of these thermal effects), a cooler running tire might be made with resulting longer life. The tread design, tread thickness, lettering on sidewall, etc., will all affect the air friction and air flow conditions, which in turn will affect the cooling of the tire. Even fender design may be an important factor.

Study of Various Pigment Blends

E.P. CHANNEL BLACK⁵-ZINC OXIDE. Since in GR-S (Buna S) zinc oxide by itself gives low tensile stocks, having relatively low heat generation and high heat conductivity, while channel black stocks give high tensile, high heat generation, and low thermal conductivity, it was felt that mixtures of these should give both high tensile strength and cool running stocks.

Compound E 1084 (see below) to which the various pigments, both alone and in combination as 30 volumes on 100 parts by weight of GR-S (Buna S), was used for this and other work described in the remainder of this paper.

Because cure curve was fairly flat for all pigments, it was not necessary to run a complete range of cures in each pigment or combination of pigments studied in order to select the best cure for the flexometer tests. A cure of 60 minutes at 292° F. was therefore used in all cases.

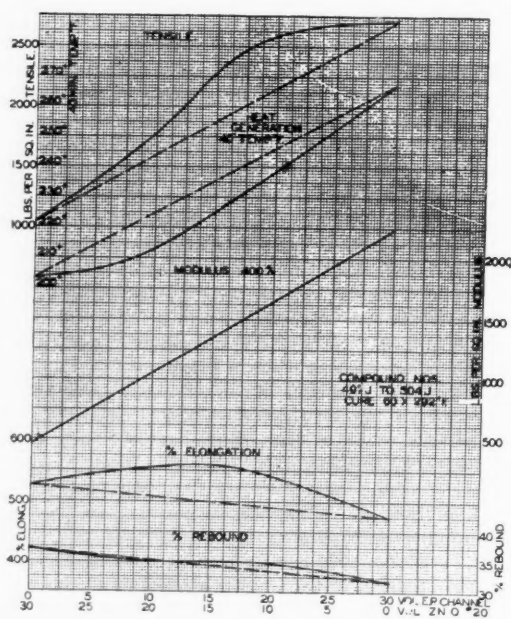


Fig. 3. Heat Generation and Physical Properties—#20 Zinc Oxide, E.P. Channel Black Blends (Actual Results ———; Calculated Results - - - -)

⁴ Hereafter referred to as S.R. furnace black.

⁵ Abbreviation for "easy processing."

E 1084 Stock		
	Parts by Wt.	
GR-S (Buna S)	100	
Sulphur	2	
Carfax	1.5	
* Zinc Oxide	5.0	
Stearic Acid	1.0	
Bardol	5.0	
* Pigment	30 Volumes	

* Five parts zinc oxide present in basic stock E 1084, for activation of 100% carbon black compounds, is in addition to specified volume loadings of zinc oxide, in compounds containing zinc oxide either wholly or in part as pigment loading.

The results, in this case using Black Label #20 zinc oxide of an average particle size of 0.2-micron and E.P. channel black blends in a 30-volume stock, are shown in Figure 3. These results indicate that one-third of the volume of E.P. channel black can be replaced with zinc oxide without appreciably lowering the tensile; while heat generation is greatly lowered. The results show that tensile properties of the blends are greater than would be expected from purely additive properties of the mixtures; while heat generation is lower than would be expected from purely additive properties. The modulus, elongation, and rebound tests are also shown.

The rebound tests were run using a St. Joe inclined plane rebound tester.⁶

Another set of tests was run using a blend of Green Label #42, a medium coarse particle-size zinc oxide, 0.28-micron average diameter, and E.P. channel black. The results obtained (see Figure 4) check those shown in Figure 3 and substantiate the conclusions already shown; namely, that tensile strengths are greater for the blends than would normally be expected for straight mixtures having additive properties, and heat generation is lower for the blends than would normally be expected.

FINE THERMATOMIC-E.P. CHANNEL BLACK. A similar set of tests was run using blends of fine thermatomic carbon black and E.P. channel black in a 30-volume stock (refer to Figure 5). The results indicate tensile strengths of the blends are more nearly additive. Heat generation or heat build-up is lower than would be expected from additive mixtures, but heat generation or build-up is con-

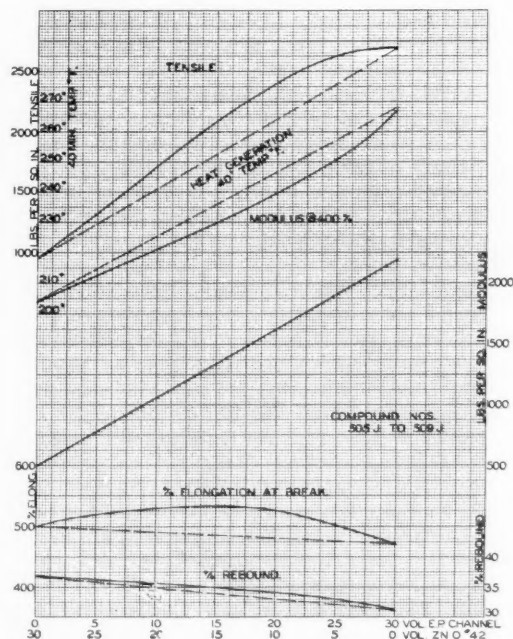


Fig. 4. Heat Generation and Physical Properties—#42 Zinc Oxide, E.P. Channel Black Blends (Actual Results —; Calculated Results - - - -)

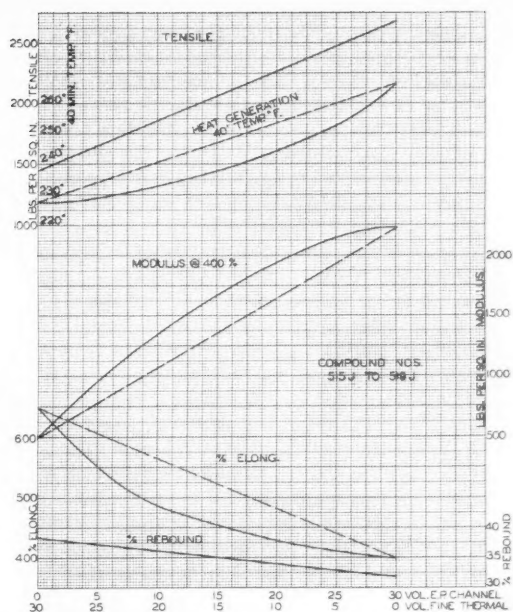


Fig. 5. Heat Generation and Physical Properties—Fine Thermatomic, E.P. Channel Black Blends (Actual Results —; Calculated Results - - - -)

siderably higher than for zinc oxide-E.P. channel black blends.

TABLE 1. COMPARISON OF BLENDS OF E. P. CHANNEL BLACK AND VARIOUS ZINC OXIDES WITH E. P. CHANNEL BLACK-SOFT BLACK COMBINATIONS CLASSIFIED ACCORDING TO HEAT GENERATION*

Material	Blend†		Tensile Lbs. Sq. In.	Elong.	Mod. (a) 400% Rebound
	Vol.	E. P. Channel Black Vol.			
Zinc Oxide (Green 42)	20	10	220° F. ‡		
Zinc Oxide (Black 20)	17	13	1715	530	1050
Fine Therm. Black	17	13	2060	557	1220
Tensile is 1800 lbs. sq. in.					
S. R. Furnace Black	17	13	236° F. ‡		
Tensile is 1800 lbs. sq. in.					
Zinc Oxide (Green 42)	14.25	15.75	2125	534	1375
Zinc Oxide (Black 20)	13.25	16.75	2410	553	1450
Fine Therm. Black	24.5	5.5	1675	543	990
S. R. Furnace Black	24.5	5.5	236° F. ‡		
Tensile is 1800 lbs. sq. in.					
Zinc Oxide (Green 42)	9.25	20.75	2425	524	1660
Zinc Oxide (Black 20)	9.70	20.30	2600	562	1630
Fine Therm. Black	12.50	17.50	2165	440	1790
S. R. Furnace Black	13.75	16.25	2025	583	—
Tensile is 1800 lbs. sq. in.					
Zinc Oxide (Green 42)	4.75	25.25	2570	500	1925
Zinc Oxide (Black 20)	6.00	24.00	2660	515	1875
Fine Therm. Black	7.00	23.00	2400	417	2070
S. R. Furnace Black	7.25	22.75	2255	418	2200
Tensile is 1800 lbs. sq. in.					
Zinc Oxide (Green 42)	1.5	28.5	2650	478	2125
Zinc Oxide (Black 20)	2.5	27.5	2670	490	2085
Fine Therm. Black	2.5	27.5	2575	405	2210
S. R. Furnace Black	2.75	27.25	2525	450	2300
Tensile is 1800 lbs. sq. in.					
Zinc Oxide (Green 42)	0	30	2687	450	2231
Zinc Oxide (Black 20)	0	30	2687	450	2231
Fine Therm. Black	0	30	2687	450	2231
S. R. Furnace Black	0	30	2687	450	2231

*Data taken from Figures 2 to 6.

†Volumes per 100 parts of GR-S (Buna S).

‡Temp. of center of plug @ 40 min. in flexometer

VL=485 lbs.

Hd=0.130-inch.

Two 1/4-inch metal faced plates.

⁶ In this apparatus the sample, which may be either a tensile sheet or preferably a specimen of 1/8-inch thickness, is placed on a sturdy steel inclined plane (20 inches long, 4 1/2 inches wide, and 1 1/8 inches thick) which has been adjusted to an angle of 15 degrees 25 minutes with the horizontal. A 1/2-inch steel ball held 10 1/2 inches above the sample by a small core electromagnet is allowed to drop on the sample on release of current in electromagnet. The ball bounces off the specimen and lands on the carbon paper on the other end of the inclined plane at a distance proportional to the rebound of the sample. The ball drops on a piece of carbon paper placed over a sheet of white paper so that the distance is recorded for permanent record by a carbon dot on the white paper. By means of a calibrated chart, drawn up from data obtained by dropping a steel ball on a number of samples and measuring the vertical rebound, the percentage rebound is easily obtained.

TABLE 2. HEAT GENERATION AND TENSILE STRENGTH—ZINC OXIDE AND E. P. CHANNEL BLACK BLENDS

	Zinc Oxide +20 —10 Vols. E. P. Channel Black —20 Vols.	S. R. Furnace Black —10 Vols. E. P. Channel Black —20 Vols.	Fine Therm. Black —10 Vols. E. P. Channel Black —20 Vols.
40 Mins. Temp. °F.,	239	244	244
Tensile Lbs. Sq. In.	2575	2175	2275
	Zinc Oxide +20 —15 Vols. E. P. Channel Black —15 Vols.	S. R. Furnace Black —15 Vols. E. P. Channel Black —15 Vols.	Fine Therm. Black —15 Vols. E. P. Channel Black —15 Vols.
40 Mins. Temp. °F.,	225	240	238
Tensile Lbs. Sq. In.	2275	2000	2075

S.R. FURNACE BLACK-E.P. CHANNEL BLACK. The results of these tests are shown graphically in Figure 6. The tensiles on the mixtures are somewhat lower than would be normally expected. Since S.R. furnace black-E.P. channel black mixtures are somewhat more difficult to disperse, these results might be expected, however. Heat generation is again higher than for the zinc oxide-E.P. channel black blends.

Comparison of E. P. Channel Black-Zinc Oxide Blends with Blends of Channel and Soft Blacks

In order to compare the heat generation and other physical properties of these mixtures Table 1 has been prepared, in which the stocks are classified using heat generation as the main criterion. The data were taken from Figures 3, 4, 5, and 6 as shown.

The results are interesting in that they show that to obtain the coolest running stock, having reasonable tensile strengths, high zinc oxide-E.P. channel black blends should be used. (See Table 2 also.) Furthermore for a given heat generation the zinc oxide-E.P. channel black blends give higher tensile strength than the S.R. furnace black. On the other hand, for a given tensile, the zinc oxide-E.P. channel black blends give cooler running stocks than blends of E. P. channel black and S.R. furnace black. (Table 1 and Figures 3, 4, and 6.)

Conclusions

A comparative analysis of some of the factors involved in road tests on tires and laboratory flexometer tests are given, which indicates that not enough attention has been paid to heat dissipation and the role of the thermal conductivity of stocks in increasing heat dissipation. The present flexometer tests, in which the sample is flexed between insulated plates, measure mainly heat generation. A modified St. Joe flexometer test is described using metal-faced plates, which takes into account not only heat generation, but heat dissipation and should more nearly simulate road tests on tires when comparing GR-S (Buna S) synthetic rubber stocks having different thermal conductivities. Using the new type test, mixtures of E.P. channel black and zinc oxide are shown to have higher tensile strength and lower heat generation than soft blacks or mixtures of soft blacks and E.P. channel blacks. The data given in this report indicate the need of further work along this line in the way of road tests on actual GR-S (Buna S) tires containing zinc oxide in both tread and carcass.

Appendix 1

COMPARISON OF SURFACE COOLING AREA THICKNESS RATIO FOR TIRE IN SERVICE AND FOR LABORATORY FLEXOMETER TEST:

- (a) Tire in Service 6.00-16
 Outer tire diameter = 28 inches
 Assume average thickness = 0.5-inch
 Cross-section circumference of casing from bead to bead = 15 inches

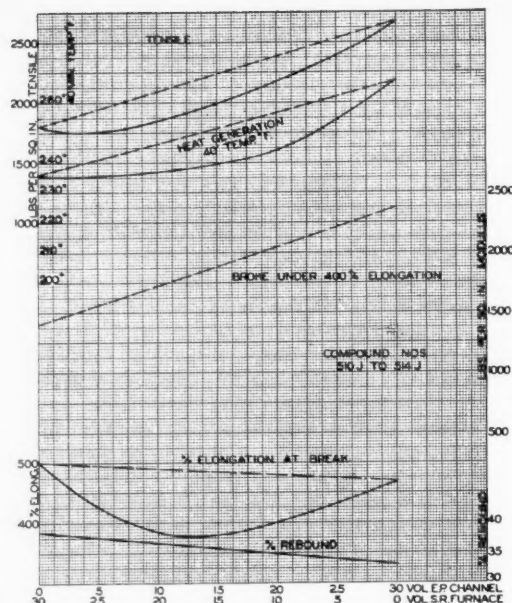


Fig. 6. Heat Generation and Physical Properties—S.R. Furnace Black, E.P. Channel Black Blends (Actual Results ———; Calculated Results - - - - -)

Outer radiating area of tire including tread and sidewall would be approximately as follows:

$$\text{Ratio of radiating area to thickness of tire in service} = \frac{\pi \times 28 \times 15}{.5} = \frac{1320}{.5} = 2640$$

- (b) Regular Laboratory Flexometer Test
 Cylindrical plug 1.5-inch diameter, 1.5-inch height
 Radiating area = $\pi \times 1.5 \times 1.5 = 7.07$ sq. in. lateral surface area of plug
 Ratio of radiating area to thickness in laboratory test = $\frac{7.07}{1.5} = 4.72$

It should be noted that radiation on tire is from outer surface only, which is not exactly comparable with laboratory specimen.

- (c) Special Laboratory Flexometer Test
 Radiating area using two $\frac{1}{4}$ -inch \times $\frac{3}{4}$ -inch diameter steel plates is calculated as follows:

Area of surface and side of $\frac{1}{4}$ -inch and $\frac{3}{4}$ -inch diameter steel plate is:

$$\pi \left[(0.25 \times 3.5) + \left(\frac{3.5}{4} \right)^2 \right] = 9.63 + 2.75 = 12.38 \text{ sq. in.}$$

$$\text{Radiating area of one plate} = 12.38 - (\pi \times 0.75 \times 0.75) = 10.61 \text{ sq. in.}$$

$$\text{For two plates, } 2 \times 10.61 = 21.22 \text{ sq. in.}$$

$$\text{Ratio of radiating area to thickness in special test} = \frac{21.22 + 7.07}{1.5} = \frac{18.9}{1.5} = 12.6$$

(Note that ratio of cooling area to thickness in a tire in service is over 560 times that for regular flexometer test)

$$\left(\frac{2640}{4.72} = 560 \right)$$

and is still 140 times that of special laboratory flexometer test

$$\left(\frac{2640}{18.9} = 140 \right)$$

Appendix 2

COMPARISON OF PERIPHERAL SPEED OF TIRE IN SERVICE AND LABORATORY FLEXOMETER TEST

- (a) Tire in Service
 Assume 6.00-16 tire on car traveling 35 m.p.h.

(Continued on page 416)

Oxidation of Rubber and Its Colloid Chemical Results¹

R. Houwink

THERE is a very comprehensive literature on the oxidation of rubber, but in it many contradictory observations by various authors are found. Formerly, when technologists had only a summary view of the colloid chemistry of rubber, few critical interpretations were based on it, and it is therefore not surprising that there are now so many conflicting opinions in this field.

A cardinal error frequently made in this connection is that in the experiments described it was stated that O₂ was absent. But it has proved extremely difficult to render rubber absolutely free of oxygen, and it must therefore be assumed that in most of these earlier experiments traces of O₂, although sometimes very slight, actually were present.² It is now known that in degradation and polymerization processes of high molecular substances very slight traces of an impurity may have considerable influence on physical properties. Thus: if 0.003% of *p*-divinylbenzene is added to soluble polystyrene, the latter may be-

come insoluble as a result of bridging between the long-chain molecules in a few places.³ On the other hand the viscosity of rubber can be considerably reduced by traces of oxygen if the O atoms sever the long rubber chains in the middle. In Staudinger's⁴ viscosity rule:

$$\eta_{sp} = K M c \quad (1)$$

$$\eta_{sp} = \text{specific viscosity} = \frac{\eta - \eta_0}{\eta_0}$$

η = viscosity of solution

η_0 = viscosity of solvent

K = constant

M = Molecular weight

c = concentration of basic molecules (structural units)

The viscosity is in proportion to the average chain length (expressed by M). If a substance consists of a few long chains, less oxygen is needed to break each of these in half than if it consisted of many small chains. In the first case, therefore, the effect per gram of O₂ is much greater. Thus with a molecular weight of 150,000 for rubber, 0.002% oxygen would, according to Scheme 1b, Table 1, be sufficient for severance;⁵ whereas a molecular weight of 150 would require 2% O₂. Accordingly, Asano's⁶ experiments in which rubber "was treated in an oxygen-free atmosphere", but nevertheless was found to contain 3.35% oxygen, must be regarded as questionable. It is likely

TABLE I. SOME POSSIBILITIES FOR POLYMERIZATION AND DEPOLYMERIZATION OF RUBBER MOLECULES; EXPECTATIONS REGARDING PHYSICAL RESULTS

Scheme	Order of Probability	Supposed Reaction	Mechanism	Physical Results	
				On Solid Rubber	On Rubber in Solution ($\eta_{sp} = KMc$)
1a	1	$\begin{array}{c} \text{H} \quad \text{CH}_3 \quad \text{H}_2 \quad \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \quad \quad \quad \\ -\text{CH}_2-\text{C}=\text{C}-\text{C}-\text{C}-\text{C}=\text{C}-\text{CH}_2- \\ \quad \quad \quad \quad \quad \quad \\ \text{R}_1 \quad \quad \quad \text{R}_2 \end{array} + 3 \text{O} \rightarrow \begin{array}{c} \text{O} \quad \text{O} \\ \quad \\ \text{R}_1-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{R}_2 \\ \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} + \text{C}-\text{R}_2 + \text{H}_2\text{O}$ <p style="text-align: center;">oxygen depolymerization</p>	Molecule severed by O ₂	Becomes softer	Decreases viscosity
1b	1	$\begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} + 2 \text{O} \rightarrow \begin{array}{c} \text{O} \quad \text{CH}_3\text{H}_2 \\ \quad \\ -\text{C}-\text{C}-\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} + \text{O}=\text{C}-\text{C}-\text{C}-$ <p style="text-align: center;">oxygen depolymerization</p>	Molecule severed by O ₂	Becomes softer	Decreases viscosity
2	3	$\begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \quad \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}-\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \quad \quad \quad \\ \text{R}_1 \quad \quad \quad \text{R}_2 \end{array} \rightarrow \begin{array}{c} \text{H} \quad \text{H}_2 \quad \text{H}_2 \\ \quad \quad \\ \text{R}_1-\text{C}=\text{C}+\text{C}=\text{R}_2 \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$ <p style="text-align: center;">true depolymerization</p>	Molecule severed without O ₂	Becomes softer	Decreases viscosity
3a	3	$\begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \end{array} + \text{O} \rightarrow \begin{array}{c} \text{H} \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \end{array} + \text{H}_2\text{O}$ <p style="text-align: center;">dehydrogenation</p>	Bridging between two molecules under influence of O ₂	Becomes harder	First decreases* viscosity; then increases it
3b	3	$\begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \end{array} + \text{O} \rightarrow \text{H}_2\text{O} + \begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H} \\ \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \end{array}$ <p style="text-align: center;">dehydrogenation</p>	Bridging between two molecules under influence of O ₂	Becomes harder	Increases viscosity
4	2	$\begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \end{array} + 2 \text{O} \rightarrow \begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \\ -\text{C}-\text{C}-\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H}_3 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \end{array}$ <p style="text-align: center;">bridging by oxygen</p>	Bridging between two molecules by O ₂	Becomes much harder	Decreases* viscosity at first; then increases it
5	1	$\begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \\ \quad \quad \quad \\ -\text{C}-\text{C}=\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{H}_2 \end{array} \rightarrow \begin{array}{c} \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{CH}_2 \\ \quad \quad \quad \\ \text{C} \quad \text{C} \quad \text{C} \quad \text{C} \\ \quad \quad \quad \\ \text{H}_2 \quad \text{H} \quad \text{CH}_3 \quad \text{CH}_2 \end{array}$ <p style="text-align: center;">cyclization (polymerization)</p>	Bridging between two molecules without O ₂	Becomes much harder	Decreases* viscosity at first; then increases it

* If the molecules were coupled as in scheme 3b, viscosity would increase constantly.

† Believe R₁ and R₂ should be reversed here.—EDITOR.

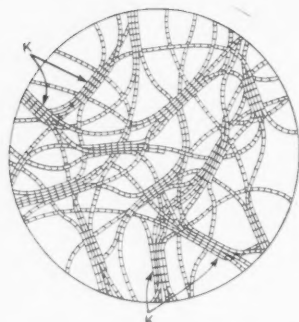


Fig. 2. Chain Molecular Structure of Rubber

K = Crystallite

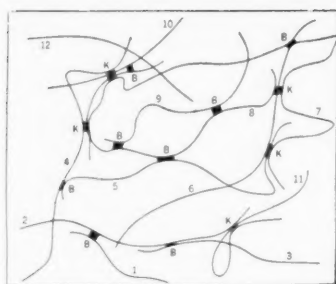


Fig. 3. Assumed Structure of Vulcanized Rubber

The chain molecules are imagined to be coupled together at the places \blacksquare B by a bridging bond. It is assumed that the chains 1, 2, and 3, for instance, are mutually connected, but are not attached to the network 4-10. In this way small aggregates (sol rubber) are obtained next to larger aggregates (gel rubber). It is possible that there are also loose chains (11 and 12) present. Besides the (chemical) bridge bonds, crystallite formation \blacksquare K, as in Figure 2, is also assumed. However, the combination K is weak (a few kcal. per mol) and is broken gentle warming and many solvents.

that in this percentage there was enough free O_2 present to have had a powerful degradation action.

Because of the marked effect of mere traces of oxygen it is easily understood why van Rossem⁷ at first concluded that oxidation was a secondary process preceded by depolymerization. The limited exactitude of investigation methods at that time did not permit the detection of the tiny traces of O_2 which initially cause a considerable reduction of η (depolymerization), though at a later stage—when larger, analytically observable amounts of oxygen come into play—the change was relatively much smaller.

It is the author's opinion that well-grounded efforts to view the results of the oxidation of rubber in the light of modern colloid chemistry are lacking in the comprehensive literature referred to. Recent, detailed summaries on the oxidation problem⁸ do exist, but the writer doubts whether these authors have realized with sufficient clarity to what colloid-chemical results polymerization and degradation processes in high polymer substances may lead.

It will be attempted to present such a consideration below; from this, however, the influence of ozone will be omitted since its inclusion would lead to various complications.⁹ It is not intended to give a complete review of the existing literature; for that the reader is referred to the sources.⁸

Structure of Raw and Vulcanized Rubber

Before the influence of oxidation is discussed, it is desirable briefly to restate our present views on the structure of rubber. The well-known general assumption is that chain molecules built up of isoprene groups, as in Figure 1, are present in raw rubber.

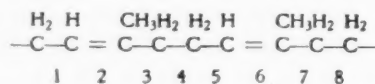


Fig. 1. Polymerized Isoprene (Natural Rubber)

Staudinger assumes that such chains have a degree of polymerization of 2,000 and hence have a molecular weight of 136,000; sometimes mention is found of still higher values,¹⁰ as, for instance, a molecular weight of 400,000.

A characteristic point for our consideration is that there is one double bond per isoprene group; it is also very important that the $-C=C-$ bond indicated by No. 4, is assumed to be the weakest in the molecule. A prediction

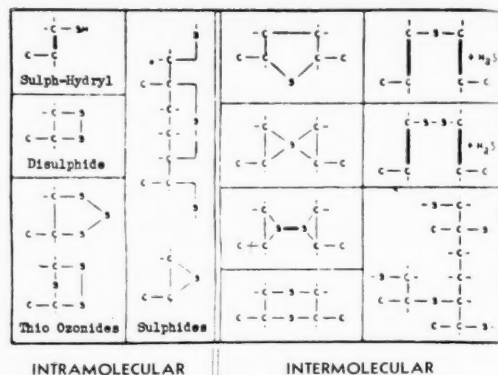


Fig. 4. Some Possibilities of Bridging by Sulphur as a Result of Vulcanization

can be made, based on Schmidt's¹¹ so-called "Doppelbindungsregel" (double-bond rule), in which it is stated that in an olefin the first single bond following a double bond is strengthened, and the succeeding one weakened. If this rule is applied to the isoprene chain in Figure 1, it will be seen that the $-C=C-$ bond No. 4, is weakened as a result of double bonds Nos. 2 and 6. Thus there is a superposition of two weakening effects, and there is no doubt that bond 4 forms the weakest link in the chain. This is clearly seen as in the dry distillation of rubber where Midgley and Henne¹² conclude that the following ratio values for rupture are obtained for the various bonds:

	Bond			
	1	2	3	4
Distillation without addition of Mg, MgO, or ZnO.....	0.7	0	0.6	100
Distillation with addition of Mg, MgO, or ZnO.....	12.1	0	12.7	106

A very plausible representation¹³ of how these chains together build up rubber is shown in Figure 2. The chains are irregularly intertwined, but in places they run more or less parallel to form crystallites K locally. Coherence in these crystallites is obtained by feeble van der Waals bonds having an energy content estimated at a few kg/cal per mol, so that they easily melt when heated. Later the idea will be developed that in practice these structural forms presumably appear in only a very few instances, but that complications due to net formations probably almost always take place. (See Figure 3.)

In vulcanized rubber it is at present generally assumed that the sulphur atoms are added to the double bonds, forming so-called bridging bonds between the rubber chains.

Figure 4 suggests various possibilities which may be divided into two groups: namely, intramolecular, left, and intermolecular bridging, right in the figure. It is perhaps possible that both types occur side by side, but that intermolecular bridging is always present. The latter hypothesis offers a satisfactory means of explaining such changes occurring during vulcanization as increase in tensile strength, hardness, temperature stability, and decrease in plasticity. These changes become comprehensible if one

⁷ "Meded. Rijksrubberdienst," Second Series, p. 465, Delft, 1919.

⁸ See the resumes by W. Gallay, Ch. Dufrasse, and F. H. Cotton "The Chemistry and Technology of Rubber," New York, 1937.

⁹ Compare A. van Rossem and H. W. Thalen, *Kautschuk*, 7, 79, (1931).

¹⁰ The Svedberg and K. O. Pederson, "The Ultracentrifuge", 424, Oxford, 1941.

¹¹ O. Schmidt, *Z. Elektrochem.*, 42, 175 (1936).

¹² *J. Am. Chem. Soc.*, 53, 203 (1931).

¹³ K. Herrmann and O. Gerngross, *Kautschuk*, 8, 181 (1932).

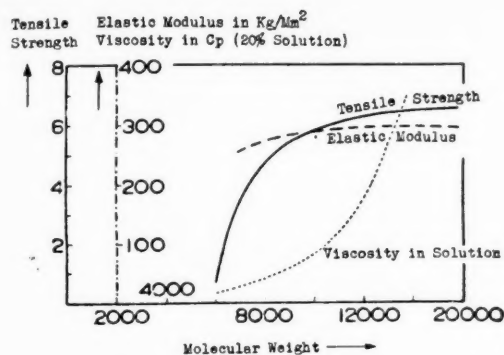


Fig. 5. Changes in Some Physical Properties of a Vinyl Polymerizate Occurring with Increasing Chain Length

considers that the highly energetic intermolecular bridges will oppose the sliding movement of the chains.

Factors Which Play a Part in Oxidation; Standards of Judgment

If a complete study of the subject is to be made, unvulcanized as well as vulcanized rubber must be considered. Oxidation depends to a great extent not only on temperature, but also to an important degree on the effect of light.

In experiments where it has been attempted to investigate the effect of ultra-violet light alone, hence when oxygen is excluded, a domain is entered where the uncertainty mentioned above concerning the reliability of the experiments, frequently exists.

The viscosity in solution, which according to (1) is very sensitive to molecule length, may be selected as chief criterion for judging the changes that occur. It is important to ascertain to what extent rubber is or is not completely soluble. For insolubility may indicate bridging between chain molecules and consequent formation of aggregates of macroscopic dimensions. Thus raw rubber is rendered insoluble by vulcanization. On the other hand it may also indicate the presence of very long chain molecules, as is deducible from Brönsted's law.¹⁴ The ratio of the amounts of solvent distributable among two fractions whose degree of polymerization is P and p , respectively ($P > p$) is:

$$\frac{C_p}{C_P} = e^{(P-p)(\epsilon RT)} \quad (2)$$

ϵ = concentration
 RT = conversion energy per base molecule.

The specific role of the solvent is expressed by the factor ϵ . In the case of polybutene, only the low polymerized fractions dissolve¹⁵ in dioxane; the medium fractions also dissolve in ethylene chloride, and all fractions, up to the very highest, in benzene.

In the solid state, the tensile strength σ_{max} is the criterion since it can roughly be stated that the cohesion between two chain molecules will increase in proportion to the length of the chain, l .

$$\sigma_{max} = Kl \quad (3)$$

K = constant.

That a maximum is here reached (see Figure 5) may be due to the fact that beyond a certain chain length the molecules no longer slide past each other, but break into pieces themselves. Increasing net formation will also enhance tensile strength as it reinforces the mutual cohesion of the chains.

Other criteria in the solid state are *elongation at break*, which generally increases with greater chain length¹⁶ and

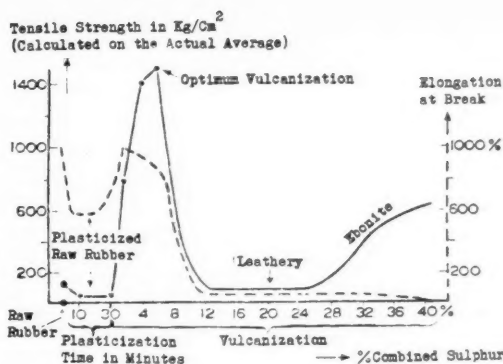


Fig. 6. Change in Tensile Strength of Vulcanized Rubber during the Manufacturing Process

(It is pointed out that the values are calculated on the actual surface during the tensile test¹⁰)

hardness which, on the basis of the observation made in connection with (3), is easily understood. However hardness will increase mainly in connection with net formation¹⁷ because the latter, in particular, will hamper the moving apart of the chains.

The tackiness of rubber in connection with oxidation is also an important criterion. Blake and Bruce¹⁸ have shown that the action of light and oxygen are necessary to produce tackiness, but ultra-violet light or ozone are not.

An example¹⁹ of the change which occurs in some of the properties previously mentioned, when polymerization increases, is given in Figure 5 applied to a vinylpolymerizate. Conversely, it may be concluded from Figure 5 that severance of the chains will be accompanied by a deterioration in both tensile strength and viscosity. Supposing net fragments are present instead of chains, approximately the same picture will be obtained as in Figure 5. For the viscosity, this follows from equation (4), which will be discussed later; as to the tensile strength, an argument analogous to that used in discussing equation (3) can be postulated for the decreasing cohesion. A difficulty in interpreting the observations on vulcanized rubber is the orientation required to appreciate the connection between the amount of combined sulphur and the properties of the vulcanizate in such compounds where it is certain that no oxygen is present. Because of the great experimental difficulties, few measurements are available; therefore the starting point for eventual explanations of the effect of oxygen on vulcanized rubber is not always unimpeachable. On the basis of analogies it is nevertheless possible to develop various views with a reasonable measure of certainty.

Table 2 gives a rough picture of the results of oxidation. It shows in what general direction the properties of rubber change under the following conditions:

- (a) If no oxygen or sulphur is present.
- (b) Under the influence of oxygen alone.
- (c) Under the influence of sulphur (vulcanization), and in the presence of some oxygen; namely, that which was dissolved in the rubber under the conditions of the experiment.

For the present the most important conclusion to be drawn from the table is that the viscosity in solution always

¹⁴ Z. Physik. Chem., Bodenstein Festband, 279 (1931).

¹⁵ W. J. Sparks and others, Ind. Eng. Chem., 32, 731 (1940).

¹⁶ This is shown for cellulose derivatives, for instance, by H. Staudinger and A. W. Sohn, J. Prakt. Chem., 155, 177 (1940).

¹⁷ "I" Congrés intern. chim., H. Mark, Madrid, 1934.

¹⁸ Proceedings of the Rubber Technology Conference, 1938, p. 736, London, 1938.

¹⁹ G. O. Curme and S. D. Douglas, Ind. Eng. Chem., 28, 1123 (1936).

decreases as a result of the influence of free oxygen, and that the tensile strength and hardness also usually decline. Under the influence of sulphur (vulcanization) the contrary is usually observed; hence it is more or less permissible to say that the closely related elements oxygen and sulphur have opposite effects.

This question and Table 2 will be considered later.

TABLE 2. ORIENTATION SURVEY OF THE CHANGES WHICH RUBBER UNDERGOES UNDER THE INFLUENCE OF FREE OXYGEN AND SULPHUR

Property	Conditions	In the dark	In Light
Viscosity in solution	Without O or S	Remains practically constant ²⁰	Increases; rubber becomes practically insoluble ^{21, 22}
	With O	Decreases ^{23, 24}	Decreases, but much more rapidly than in the dark. Remains soluble ^{23, 24, 25}
	With S	Rises during vulcanization; becomes insoluble	Rises, becomes insoluble ²⁶
Tensile strength in solid state	Without O or S	Remains constant	Rises
	With O	Declines, but under certain conditions may rise ²⁷	Same as in the dark
	With S	Rises; fully affected O ₂ ; rises ²⁸	Same as in the dark
Hardness and tackiness	Without O or S	Remains practically constant ²⁷	Becomes hard and not tacky ²⁹
	With O	Becomes cheesy, then sometimes hard, sometimes tacky ²⁸	Becomes soft and tacky ²⁸
	With S	Becomes harder ²⁷	Becomes harder ²⁷

Polymerization and Depolymerization Possibilities of Rubber under the Influence of Oxygen

From Figure 1 it appears that sulphur in general effects such changes in rubber as may be compatible with the formation of intermolecular bridging. The increase in viscosity which rapidly leads to insolubility, the mounting tensile strength during vulcanization (*see Figure 6*), and the growing hardness, point in this direction. However oxygen is strongly inclined to alter these properties in the opposite direction, and this point leads to the thought that oxygen has a greater tendency to depolymerization, to breaking down molecules, although the capacity for a polymerizing action is not to be excluded.

In Table 1 some schemes are given of reactions with oxygen which, on the strength of various experiences with highly polymerized substances, may be assumed to be admissible. Under 1a²¹ and 1b are found schemes of oxygen-depolymerization where the chain molecules are severed either in the weakest spot (4), as shown in Figure 1, or at the double bond. Both processes, if taking place in the middle of the molecule, would lead to a reduction by half of the viscosity and would render solid rubber more fluid. Both reactions possess a great measure of probability, as the second column indicates. Under 2 we find an example of true depolymerization, which therefore proceeds without oxygen and amounts to severance of the molecule in its weakest spot (4).

Schemes 3a and 3b represent dehydrogenation reactions attended by the coupling together of two molecules. It will depend entirely on the steric form which the final product assumes whether the viscosity decreases in the beginning (Scheme 3a; here two chains are practically united to one thicker one)²² or increases (Scheme 3b). Ultimately η will increase in both cases because increasing bridge-formation finally leads to insolubility. A minimum in the η -polymerization degree curve may therefore be expected here. The processes 3a and 3b both will result in the solid rubber becoming still firmer because the bridging that takes place between the chains will hinder the sliding of the molecules.

In Scheme 4 we see how a bridging action similar to that assumed for sulphur can also be attributed to oxygen. If this reaction runs its course, the final effect will be comparable with that in vulcanization. Here too, as in Scheme 3a, an initial decrease followed by an increase in viscosity may perhaps be expected.

Scheme 5 represents the cyclization reaction, which also leads to bridging between the chain molecules and which, therefore, is comparable to Scheme 4 in its physical effect.

We shall now describe some of the most striking phenomena encountered in vulcanization and oxidation and attempt to give a plausible explanation for them based on Table 1 and on some working hypotheses which will be set up. The writer realizes that these working hypotheses are far from established and complete in all details.

Working Hypotheses

The possibility may be considered that the rubber molecules in the latex globules in the tree have the form of free-lying chain molecules, although the writer believes that this has by no means been proved. It is equally conceivable to him that molecular nets are present in the latex globule.

However immediately the latex has left the tree for any time (but perhaps even while it is still in the tree), nets which may have been formed according to Scheme 5, Table 1,²³ are presumed to be present. The action of light or heat in the absence of O₂ promotes this cyclization. Action of O₂ under the influence of very definite oxidants leads to bridging, according to Scheme 4, possibly Scheme 3 or 5.

In such factory operations as plasticizing and heating in the presence of oxygen, the molecule is easily broken off, as in Scheme 1a, Table 1. If no oxygen is present, the degradation effect (Scheme 2) of plasticization is very slight. If the action of light takes place in the presence of oxygen, then oxygen depolymerization predominates over the enlargement of the molecules by net-formation mentioned above. It is even probable that light and oxygen together have a more pronounced depolymerizing effect than oxygen alone; perhaps oxygen in its depolymerizing action is more powerfully activated by light than the double-bond in its cyclizing action.

In contrast with oxygen, sulphur always has the effect of enlarging molecules. Under the heading "Reduction in Tensile Strength Accompanying Over-Vulcanization", however, the possibility will be suggested that after the stage of overvulcanization is reached, sulphur may have a depolymerizing effect.

Testing These Working Hypotheses

It will be attempted to prove these working hypotheses against data from the literature.

PRESENCE OF CHAINS IN LATEX. There are references indicating^{20, 21} that plantation rubber is not completely sol-

²⁰ O. de Vries, "Estate Rubber", pp. 573, 623, Batavia, 1920.

²¹ T. L. Garner, *Trans. Inst. Rubber Ind.*, 4, 413 (1928/29).

²² D. Spence and J. D. Ferry, *J. Am. Chem. Soc.*, 59, 1648 (1937).

²³ For bibliography see P. Dekker, "Meded. Rijksrubberdienst", Second Series,

p. 480, 1936.

²⁴ G. Bernstein, *Kolloid-Z.*, 11, 185 (1912); 12, 193, 273 (1913).

²⁵ C. O. Weber, *Ber.*, 33, 779 (1900).

²⁶ R. Houwink, "Elastizität, Plastizität und Struktur der Materie", p. 186, Dresden, 1938.

²⁷ K. Memmler, "Handb. der Kautschukwiss.", pp. 199-211, Berlin, 1930.

²⁸ G. T. Kohman, *J. physik. Chem.*, 33, 226 (1928).

²⁹ V. Henri, *Caoutchouc & gatta percha*, 7, 4371 (1910).

³⁰ The actual load is calculated from the formula $\sigma_{\text{actual}} = \sigma_{\text{nominal}} (1 + \Delta l)$. It presents a more exact measure for a good physical comparison than the values calculated on the original surface of the test piece.

³¹ That H₂O may develop during oxidation has been shown by F. Kirchhof, among others, *Kolloid-Z.*, 13, 49 (1913).

³² Since 2 l. passes over into 1, and the thickness d does not appear in equation (1) a decrease in n may be expected.

³³ That the double bond actually does play a preponderating role here—an argument in favor of the cyclization theory appears from the fact that hydro-rubber, polystyrene (Kautschuk, Nov., 1934), and polybutene³⁴

are not converted into insoluble products by irradiation.

³⁴ Compare also F. C. Heurn, "Meded. Rijksrubberdienst", Third Series,

p. 448, 1916.

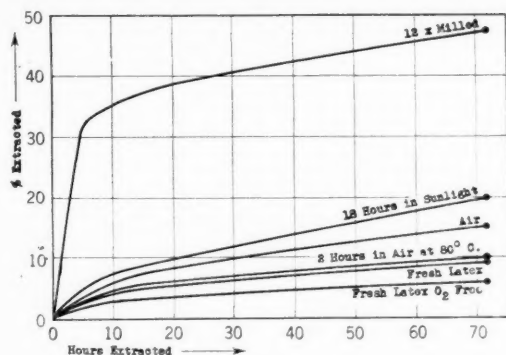


Fig. 7. The Soluble Part of Raw Rubber Can Be Increased by Various Kinds of Treatment in Presence of O_2

uble. Nevertheless it is possible that at first there were chiefly loose chains present in the latex globules, and the insoluble part must perhaps be accounted for by the proteins or other impurities. But it is equally possible that there were net structures not completely severed during the washing process on the estates—which is also a kind of plasticization—aided by O_2 . For Spence and Ferry²⁵ have found in latex that was sterilized in sealed tins directly after tapping, up to almost 20% of gel rubber, which their investigation shows was not formed as a result of sterilization. In commercial latex they found about 40% gel rubber. We are therefore really still groping in the dark on the question as to whether nets were present in the latex when it was in the tree, and so long as the contrary is not proved, we shall keep this possibility open.

FORMATION OF NETS DURING STORAGE. It is a well-known phenomenon that²⁷ rubber in storage becomes more and more insoluble. From investigation by Kemp and collaborators²⁶ in particular, it appears that after latex films dry up, only a very small percentage of the rubber as a rule is soluble in very organic solvents such as benzene. It is only after dried rubber has been more or less plasticized on the estate, by washing for instance, that a large part goes into solution. This end can also be attained by inducing the action of oxygen in other ways, for instance, by warming thin sheets in the air or by exposure to sunlight in the presence of oxygen. Figure 7 illustrates this. On the basis of the argument given in connection with equation (2), we may inquire whether the development of insolubility during storage is caused by net formation or by a linear growth of the chain molecules. In our opinion there is little room for doubt; the continued linear growth of the long-chain molecules at room temperature can scarcely be considered possible, if only on the ground that the chance of collision between the two extremities is very slight. We shall therefore proceed from the thought that the insolubility of rubber is based on net formation, and in agreement herewith is the fact that crystals of gel rubber have elastic, and crystals of sol-rubber, plastic properties; whereas after vulcanization (net formation) they show an equally elastic behavior.³⁷

²⁵ J. Soc. Chem. Ind., 58, 346 (1939).

²⁶ A. R. Kemp and H. Peters, *J. physik. Chem.*, 43, 923 (1939).

²⁷ W. H. Smith and C. P. Saylor, National Bureau of Standards, Research Paper No. 719 and No. 720.

²⁸ The authors even speak of "in the absence of air." In the opinion of the writer, however, free oxygen was certainly present in the experiments described.

²⁹ J. W. van Dalen [*Arch. Rubbercultuur*, 22, 129 (1938)] does indeed find a tensile strength up to 300 kg/cm² for unvulcanized rubber sheets prepared by evaporating latex, but according to his investigations this result must be ascribed to the non-rubber constituents (presumably the proteins) and depends to a considerable extent on the moisture influences of the environment. Regarding the tests by Spence and Ferry, which were always carried out under the same standard conditions, it cannot be assumed that the increase of σ_{max} in Figure 6 can be referred to decreasing moisture content.

The insoluble part, almost always present in natural rubber, has produced an overwhelming amount of investigation, especially in the earlier literature, and conflicting results have frequently been noted.²⁸ Sometimes we find that when rubber is heated, the insoluble part increases; in other cases there is a decrease; occasionally there is first an increase, then a decrease. These contradictions are probably largely due to the fact that two opposing reactions take place simultaneously: oxygen depolymerization (Scheme 1), and polymerization by cyclization (Scheme 5, Table 1). This is clearly seen in an experiment by Garner²¹ where irradiation in the presence of O_2 leads to a lowered viscosity, but in the absence of O_2 to gel-formation (hence, increased viscosity). When it is considered that many investigators did not sufficiently realize the effect of slight traces of oxygen mentioned in the introductory paragraphs, or of the effect of light, then it becomes plain that a lucid interpretation of the phenomena observed is difficult.

Apparently we may also assume that net-formation due to oxygen takes place under the influence of certain oxidation agents, as benzoylperoxide and nitrobenzene. Spence and Ferry²² describe such an "oxygen vulcanization," among others, for naphthachinon, *p*-benzochinon, and potassium ferricyanide, provided no great excess of oxygen is present;²⁸ otherwise the depolymerizing action of oxygen (Scheme 1?) again predominates, as Table 3 shows.

TABLE 3. POLYMERIZATION AND DEPOLYMERIZATION BY OXYGEN UNDER THE INFLUENCE OF POTASSIUM FERRICYANIDE

K Fe (CN) ₆	Treatment	Soluble in 14 Days	Swelling Index
0%	untreated	75%	120
0%	5 hrs. 100°, air absent	73%	110
0.3%	5 hrs. 100°, air absent	32%	26
0%	5 hrs. 100°, air present	92%	soluble
0.3%	5 hrs. 100°, air present	89%	soluble

In Figure 8²⁹ it is shown how in the presence of 1.2% naphthachinon 1, 4 the swelling and solubility of a rubber film decrease when irradiated, while the tensile strength, on the other hand, increases very markedly. The ultimate value obtained for tensile strength, about 140 kg/cm², is very reasonable as against that of vulcanized rubber, which may be about 300 kg/cm² for sheet.³⁹

DEPOLYMERIZATION OF RUBBER MOLECULES BY OXYGEN. To show how the viscosity in solution is influenced respectively by heating, plasticizing, and irradiation, in the presence of oxygen, we refer to Figure 9. In all these cases a decrease to the same final value is observed, indicating the formation of similar end-products. Special at-

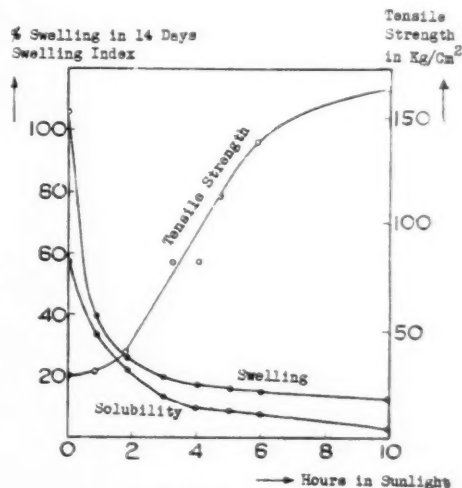


Fig. 8. Polymerization by Oxygen under the Influence of Oxidants (Naphthachinon)

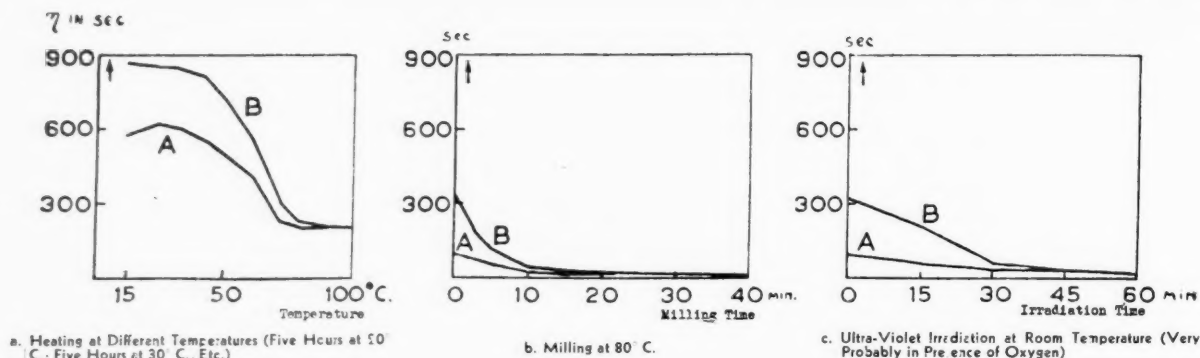


Fig. 9. Decrease of the Viscosity in Solution by Various Kinds of Treatment in Presence of Oxygen. The Viscosity Is Measured by Giving the Flow Period in Seconds of a 3% Xylol Solution. A is a Hevea Plantation Rubber, B a Wild Rubber

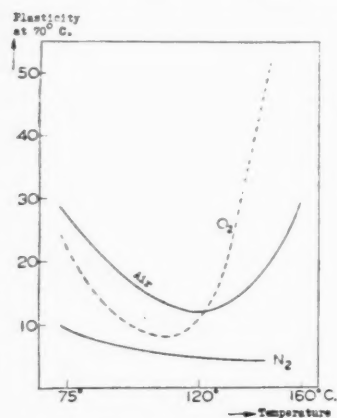


Fig. 10. Influence on Plasticity of Temperature and Various Gases (Plasticity Measured in Goodrich Plastometer)

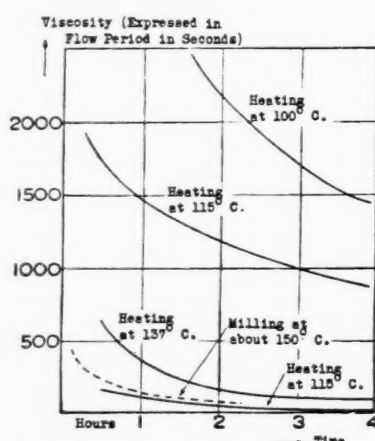


Fig. 11. Effect of Various Degradation Methods on the Viscosity of Rubber in Solution

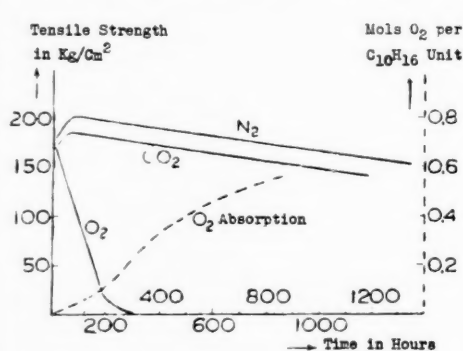


Fig. 12. Connection between Oxygen Absorption and Tensile Strength

tention is called to Figure 9c, which shows that irradiation in the presence of oxygen leads to depolymerization.^{2, 21, 40} In these experiments the contrast between oxygen and sulphur is clearly disclosed; thus addition of sulphur to the solution led to gelatinization after as little as 10-15 minutes of irradiation, and after 40 minutes 2.56% of chemically combined sulphur was present.

It is interesting to review the comparison between heating and plasticization because the belief is often met with in the rubber industry that plasticization actually amounts to a mechanical breaking up of the rubber molecules. This conception is probably only partly correct. The experiments by Busse and Cunningham,⁴¹ shown in Figure 10, teach that plasticizing in air at 75° C. and 165° C., respectively, causes plasticity to increase four times as rapidly as at 120° C. It is likely that the molecules are more powerfully affected by mechanical influences at a lower temperature (75° C.) because the rubber is stiffer. Apparently the combined action⁴² of mechanical treatment and oxidation in this case leads to accelerated degradation because, as appears from Figure 10, this acceleration is not observed in an N₂ atmosphere. At high temperature

(165° C.) this acceleration is obviously ascribable to the increased rate of the oxygen reaction.

Reference may also be made to Figure 11, from Fry and Porritt,⁴³ which indicates that milling at about 150° C. has practically the same effect on viscosity in solution as heating at a similar temperature in air. These considerations led to the production of so-called softened rubber on estates where thin sheets of rubber are subjected to an oxidation process; by this means a saving is effected in the milling energy required for subsequent processing in the factory.

To what extent oxygen decreases the tensile strength of rubber²⁸ may be seen from Figure 12; 0.5% O₂ (0.02 mol. O₂ per C₁₀ H₁₆ unit) is sufficient⁴⁴ to reduce it by half. When heating takes place in inert gases, tensile strength declines but little.

That the double bond—either directly or indirectly on the basis of Schmidt's rule—plays a great part in this breakdown of the chain is demonstrated by comparison with polybutene. Even ozone seems to have hardly any effect¹⁵ on the latter, and if Figure 1 is compared with Figure 13, it is obvious that the absence of the double bond must be held responsible.

The conclusion is reached that oxygen may have a polymerizing as well as a depolymerizing action, and Spence and Ferry's study demonstrates that both reactions seem to proceed simultaneously. They have shown that the polymerizing reaction predominates when the rubber content is high; but when the rubber content is low, the depolymerizing reaction prevails. This is in complete agree-

⁴⁰ How sensitive this reaction is appears from observations by F. C. van Heurn (*Meded. Rijksherbarium*, Second Series, 1916, p. 357) who showed that η will decrease while the solution flows through the viscosimeter if the latter is used in an illuminated room.

⁴¹ "Proceedings of the Rubber Technology Conference, 1938", p. 288.

⁴² In the writer's opinion it is quite possible that oxidation is sterically hampered because the rubber molecule is tightly curled up (compare E. Mark, Jr., *J. Am. Chem. Soc.*, 56, 2757 (1934)). Then a mechanical treatment like milling might be able to lead to an opening up of a molecule so that bond 4 becomes more accessible to oxygen.

⁴³ J. D. Fry and E. D. Porritt, *Trans. Inst. Rubber Ind.*, 3, 203 (1927/28).

⁴⁴ J. H. Ingmanson and A. R. Kemp, *Ind. Eng. Chem.*, 30, 1168 (1938).

ment with expectations for when the rubber content is reduced, the chances of collision according to Schemes 3, 4, and 5 decrease whereas those in accordance with Scheme 1 remain the same because the quantity of dissolved oxygen does not change. It may be assumed that the polymerizing reaction is one with low activation energy (light of 2500 Å), the depolymerizing reaction, one with high activation energy.

Tackiness is probably due to a break-down of the molecule, coupled with the formation of dipoles (Scheme 1) but we shall not enter into details here. The phenomena observed for unvulcanized rubber differ in part from those for vulcanized rubber. For the latter material Kohman²⁸ found:

with 0.02-0.05 mol O₂ per C₁₀ H₁₆ group (0.5-1.25 weight % O₂) the rubber became tacky

with 0.5 mol O₂ per C₁₀ H₁₆ group (12 weight % O₂) tackiness disappeared

with 1.0 mol O₂ per C₁₀ H₁₆ group (24 weight % O₂) the rubber became brittle.

Accordingly it is sometimes observed that oxidation causes vulcanized rubber first to become softer, then harder, as the following data⁴⁵ show:

Shore durometer hardness after six hours.....	100° C. 35 units
Shore durometer hardness after three days.....	100° C. 27 units
Shore durometer hardness after two weeks.....	100° C. 15 units
Shore durometer hardness after four weeks.....	100° C. 25 units

These observations point to an initial depolymerization (Scheme 1?) followed by resinification (Scheme 4?); however an exact interpretation is not yet possible.

POLYMERIZING EFFECT OF SULPHUR. That sulphur during vulcanization leads to one or more of the possibilities for net formation indicated in Figure 4 is hardly open to doubt any longer. Confirmation of this is seen in the fact that polybutene which, as Figure 13 shows, contains no double bonds, cannot be vulcanized.¹⁵

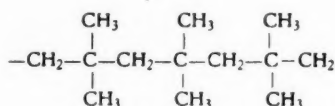


Fig. 13. Polybutene

On the other hand the heat employed during vulcanization causes a slight amount of molecular degradation, which finds expression in a reduction of the tensile strength.

We shall now follow the changes in tensile strength as sulphur combination increases, shown in Figure 6.²⁶

The considerations under "Factors Which Play a Part in Oxidation" would seem to justify the expectation that progressively more intensive net formation would be accompanied by a continuous rise in tensile strength;⁴⁶ but this by no means proves to be the case. In Figure 6 we see how the tensile strength of raw rubber declines when plasticized, but rises again as soon as sulphur combination commences. All this is easy to understand; but now the important question arises: Why does the tensile strength begin to decrease after the combined sulphur exceeds 6% and rise again at the so-called ebonite-forming stage? This will be discussed below.

⁴⁵ A. J. Wildschut, unpublished observations.

⁴⁶ As is also the case, for instance, in the hardening of bakelite resins, in connection with which a constantly increasing "Vernetzung" (net formation) also takes place.

⁴⁷ K. H. Meyer and J. Jeannerat, *Helv. Chim. Acta*, 22, 19 (1938).

⁴⁸ Staudinger did himself actually assume the presence in sol rubber of net fragments formed by plasticizing gel rubber. But it is very questionable whether he was aware that the possibility must be reckoned with that net fragments, instead of small rods or chains, are always present in sol rubber.

⁴⁹ *Angew. Chem.*, 49, 858 (1936).

⁵⁰ *J. prakt. Chem.*, 157, 15 (1940).

⁵¹ *Ibid.*, 155, 261 (1940).

Some Further Considerations Elicited by the Oxidation Problem

CALCULATION OF THE MOLECULAR WEIGHT FROM VISCOSITY MEASUREMENTS. If the conclusions arrived at above on the simultaneous polymerization and depolymerization of rubber during storage and by oxidation are accepted, then sol rubber must not be regarded as a dispersion in which only individual chain molecules are present, but as one in which net fragments (hence three-dimensional bodies) are also—perhaps predominantly—present. On this basis we shall suppose the structure of raw rubber to be as shown in Figure 3.

Kemp and Peters² have determined the molecular weight of various sol fractions by Staudinger's method. It was found that there is a continuous transition from sol to gel; the fraction having a molecular weight of 210,000 was designated as almost insoluble (hence the beginning of gel). If it is further considered that examination showed the gel to be 2000% swollen, and if the reasonable assumption is made that the net fragments of the sol rubber are also swollen to this degree, then, by calculation, a particle (if for the sake of convenience it is supposed to be a cube) with a molecular weight of 210,000, has a side of 200 Å. Meyer⁴⁷ has found that sol rubber just manages to pass through a filter with pores of 1000 Å, which therefore indicates for sol rubber a size of the same order as that just determined. This agreement offers support for the conception of a three-dimensional structure of the net fragments. Measurements with the ultracentrifuge¹⁰ also seem to lead to the conclusion that the rubber molecules in solution do not form stretched chains; it is assumed that the chains are rolled up or branched. From a hydrodynamic point of view this amounts to the same as our assumption of net fragments.

Consequently if we proceed from the point that three dimensional loosely constructed particles (net fragments) are nearly always in large measure present in sol rubber, then the very important question immediately arises as to how far the Staudinger viscosity formula (1), which is based on the assumption that the molecules are long chains, retains its value.⁴⁸

Starting from the hypothesis that the rubber molecules in solution might take the form of loose, easily deformable coils or clews, Kuhn,⁴⁹ on the basis of hydrodynamic considerations, calculated that the following equation applies to such a coil:

$$\eta_{sp} = KcM^{0.8 \text{ to } 0.9} \quad (4)$$

The writer⁵⁰ is of the opinion that a similar formula, but with a value of 0.6 for the exponent, may be developed from measurements by Staudinger, at least in the case of polar polyesters. In Table 4 the maximal ratios between osmotically (actual) and viscosimetrically obtained molecular weights as found by Staudinger and Warth⁵¹ are given:

TABLE 4. MAXIMAL RATIO BETWEEN OSMOTICALLY AND VISCOSIMETRICALLY DETERMINED MOLECULAR WEIGHTS OF SOME POLYESTERS

Ester	Average Mol. Wt.		Ratio	M. W. Osm.
	Osmot.	Viscosim.		M. W. Visc.
Polyvinylacetate in acetone.....	330,000	40,000		8
Polyvinylalcohol in water.....	78,000	21,000		3.7
Polyacrylic-acid-methylester in acetone.....	321,000	30,000		6.5
Polymethacrylic-acid-methylester in acetone.....	250,000	60,000		4.2

From Table 4 it may be concluded that the viscosimetric method gives a result for these polyesters which is three to eight times too low. However the situation is probably less unfavorable in the case of rubber. For if loose, easily deformable, net fragments are assumed to be present,⁵²

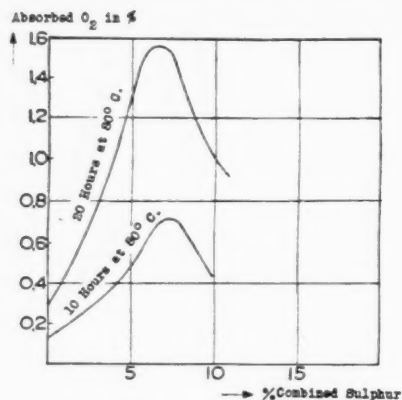


Fig. 14. Connection between Oxidizability and Combined Sulphur Content. Oxidizability Is Expressed in % O_2 That Is Absorbed When Heat Is Applied for One Hour at 80° C. according to the Dufrasse Method

then from a hydrodynamic standpoint the same considerations as apply for Kuhn's coils or clews will also be valid here. But the rubber molecule is not polar; consequently the net fragments may be expected to be less closely packed than the polar polyester molecules; the exponent in (4) will therefore be higher than 0.6. It may even exceed 1, for Kuhn suggests a value of 2 as an extreme possibility.

REDUCTION IN TENSILE STRENGTH ACCOMPANYING OVER-VULCANIZATION. Under "Polymerizing Effect of Sulphur" it was shown that when the amount of about 6% of combined sulphur is exceeded (over-vulcanization) the tensile strength suddenly declines steeply. Heating alone cannot cause this decline, for when the sulphur content is low,⁵² the tensile strength scarcely decreases even when vulcanization is continued for eight hours—if a suitable accelerator is used.

The thought that oxidation phenomena play an important part in vulcanization is evoked by Figure 14, from Dufrasse,⁵⁴ which shows that oxidizability increases with the degree of vulcanization and is very considerable in precisely that interesting zone between 5 and 10% combined sulphur, as Figure 6 indicates. Unfortunately Dufrasse's investigations do not go beyond mixes with 10% combined sulphur; further work is therefore urgently needed here.⁵⁵

The question arises whether the oxidation taking place

during vulcanization in the press, when about 6% sulphur is combined, is sufficiently intensive to cause nets already formed to separate into fragments. To make this possible, at least two conditions must be satisfied:

(1) The rate of oxidation must be sufficiently great to start the depolymerization process in about one hour to two hours at 140° C. (curing conditions).

(2) Enough oxygen must be present to reduce the tensile strength of about 1500 kg/cm² to 50 kg/cm².

It should be noted that the investigation by Kemp and collaborators⁵⁶ indicates that absorption of about 1.5% O_2 is required to reduce the tensile strength to around 50 kg/cm².⁵⁷ From the investigation by Kemp and associates⁵⁶ it can be deduced by extrapolation that in a mix with a maximum of 3% combined sulphur, the rubber actually will absorb about 1.5% O_2 in two hours at 140° C. If it is taken into account that the rate of oxidation increases with extraordinary rapidity as vulcanization progresses⁵⁸ (see Figure 14), then it is certain that under the curing conditions in the press, the rate of oxidation is amply sufficient to reduce the tensile strength to 50 kg/cm².

As to the question whether enough oxygen is present in suitable form, we cannot speak with similar assurance. Williams and Neal⁵⁹ find that at 20° C., only 0.02% O_2 dissolves in rubber, and from data by Venable and Fuwa⁶⁰ it can be deduced by extrapolation that the solubility at 140° C. will amount to only 0.004%. But even if we consider the most favorable case, namely that O_2 has no opportunity to diffuse away during vulcanization, then 0.02% still is insufficient, and the question arises whether oxygen is perhaps also present in a different form than the physically dissolved oxygen here discussed. Midgley and collaborators⁶¹ found that about 0.03% O_2 is present as OH in natural rubber, but even if this is included, we are still a long way from the required 1.5%.

Cramer and associates⁶² found about 1.3% O_2 in raw rubber, of which, however, approximately 1.2% is present in the impure rubber hydrocarbons (resins, etc.). To what extent this 1.2% is still active for further oxidation purposes must be considered. According to Cramer, when plasticizing is continued for 60 minutes, the O_2 content increases by 0.17% and remains essentially constant during vulcanization. The ingredients like ZnO, S, etc., together contain only about 0.1% O_2 calculated on the rubber. This once more brings us to the conclusion that if the O_2 present in the impurities (in this case 1.2%) is incapable of participating in the oxidation process, there is not enough O_2 present to explain the decline in the tensile strength which accompanies over-vulcanization.

An investigation by van Rossem and Dekker⁶³ also points in the same direction; in rubber in an advanced state of cure (6.7% combined S), they found only 0.5% oxidation product which contains about 0.02% O_2 calculated on the rubber. This figure agrees very well with the amount of O_2 physically dissolved in rubber, referred to above.

We therefore come to the conclusion that there is probably not enough O_2 present during vulcanization to explain the decline in tensile strength by oxidation, unless it is admitted that (a) in rubber mixes with high sulphur content, the oxidation products which develop according to Scheme 1a or 1b. In Table 1, again split off O_2 and are capable of renewed activity in breaking down the molecules; or (b) the O_2 present in the non-rubber constituents is capable of an oxidizing action. At present no sound arguments can be adduced in favor of either of these assumptions,⁶⁴ and so we arrive at the question whether perhaps sulphur itself, when present in great excess, is capable of breaking down the molecules. It has been seen

⁵² If the nets were not easily deformable and did not enclose much fluid, no increase at all in viscosity would accompany the growth of the three-dimensional bodies.

⁵³ B. S. Garvey and D. B. Forman, *Ind. Eng. Chem.*, 30, 1036 (1938).

⁵⁴ C. Dufrasse and A. Etienne, *Comm. Congres. Int. Caoutch.*, p. 101, Paris, 1937.

⁵⁵ The same applies to a second investigation (C. Dufrasse and J. le Bras, *Rubber Chem. Tech.*, 12, 805 (1939)) on the oxidizability when vulcanizing agents other than sulphur are used (dinitrobenzene, etc.). J. M. Wright and R. L. Davies [*Trans. Inst. Rubber Ind.*, 13, 251 (1937/38)] have published investigations where the ebullite stage has been reached with S-free vulcanizers, but unfortunately the mechanical properties were not sufficiently well examined to serve as a basis for a consideration.

⁵⁶ A. R. Kemp and others, *Ind. Eng. Chem.*, 31, 1472 (1939). Data in Figure 2 combined with those from Table 2 in Kemp's article.

⁵⁷ *Ibid.*, Data taken from Figure 1.

⁵⁸ The investigation by Kohman⁵⁸ teaches us approximately the same thing. In this calculation d_{max} calculated on the actual average is taken into consideration. (See ⁵⁶.)

⁵⁹ With an increase in the combined sulphur content of 0.71% the rate of oxidation increased seven times, see Figure 8 in the investigation by Kemp.⁵⁶

⁶⁰ *Ind. Eng. Chem.*, 22, 874 (1930).

⁶¹ *Ind. Eng. Chem.*, 14, 139 (1922).

⁶² T. Midgley, A. J. Henne, A. F. Shepard, and M. W. Renoll, *Rubber Chem. Tech.*, 9, 74 (1936).

⁶³ H. I. Cramer, I. J. Slothum and L. E. Oueacre, "Proceedings of the Rubber Technology Conference, 1938", p. 572.

⁶⁴ *Kautschuk*, 5, 13, (1929); "Proceedings of the Rubber Technological Conference, 1938", p. 587.

⁶⁵ Thus Midgley and associates⁶¹ conclude that the O_2 when acting on rubber does indeed form peroxides, but that these break down forming an OH group. The oxygen thus fixed is presumably not capable of renewed activity in breaking down molecules.

that, depending on the circumstances, oxygen is capable of either a polymerizing or a depolymerizing action. Why should this not also be the case for the closely related element sulphur?

We do not now wish to enter into this possibility more deeply because still fewer quantitative data are available on this problem than exist on the oxidation problem itself. If there actually should be such a possibility, then working hypothesis No. 5 will have to be amplified. "In contrast with oxygen, sulphur always has the effect of enlarging molecules."

In a following article we hope to consider the mechanism of the oxidation reaction in rubber.

Summary

After the structure of raw and vulcanized rubber is discussed, the reactions which probably take place between the rubber molecule, O_2 and S, in presence and absence of light, are indicated. Depending on circumstances, a severance of the molecule or net formation may be expected (dehydrogenation, formation of oxygen and sulphur bridges, cyclization); see Table 1.

The accompanying changes in solubility, viscosity in solution, tensile strength, hardness and tackiness, are described.

Special attention is drawn to the very great effect that traces of oxygen, so slight that they cannot be shown analytically, may have because of the highly polymerized structure of rubber.

Working hypotheses are established to explain the effect of the external factors mentioned, and these hypotheses are tested against extensive observation material. One of the most important conclusions is that it must probably be assumed that net formed (chiefly cyclized) aggregates are present in unvulcanized rubber instead of, or in addition to, chain molecules. (Figure 3). How this affects the value of the method of determining molecular weight from viscosity measurements is discussed, and it is suggested that Kuhn's viscosity formula (4), probably with modification of the value of the exponent, will have to be applied instead of the Staudinger formula (1).

It is also attempted to explain the drop in tensile to about 50 kg/cm² (see Figure 6) which occurs after optimum vulcanization is exceeded. It is attempted to place the responsibility for this on the oxidation which takes place during vulcanization. But it is shown by calculation that the conditions for this are in all probability not fulfilled. The rate of oxidation is high enough to reduce tensile to 50 kg/cm² during normal curing conditions, but the amount of O_2 required for this purpose, about 1.5%, is probably not present in rubber in a suitable form. A conclusive explanation of this decrease in tensile cannot as yet be given.

To Figure Horizontal Tank Capacities

Although horizontal tank capacities are commonly regarded as difficult to compute, here is a chart that gives the gallons of liquid in any horizontal tank without the use of tables, formulas, figures, or computations of any kind. Simply start at the left and zig zag a ruler or thread across the chart three times as demonstrated by the dotted lines, and the number of gallons is immediately found in column G.

For example: How many gallons in a tank 84 inches in diameter, the depth of liquid being 30 inches, and the length of the tank 142 inches? Run a straight line through the 84, column A, and the 30 in column B and find the intersection with column C. By means of the eye follow the radiating "guide lines" to Column D, find a second point of intersection. From this latter run through the 142, column E, and locate the point of intersection in column F. Then from this point run over to the 84, column H, and the intersection in column G will be found to be close to 1,050 gallons, which is the answer.

One of the important advantages of this chart is that it takes care of any depth of liquid from $\frac{1}{16}$ -inch to full capacity of the tank. All guess work is eliminated. To make the chart absolutely clear the writer has included sketches showing the diameter of the tank D, depth of liquid h, and length of tank L with wavy arrows leading from them to the proper columns. By following them carefully no mistake can be made.

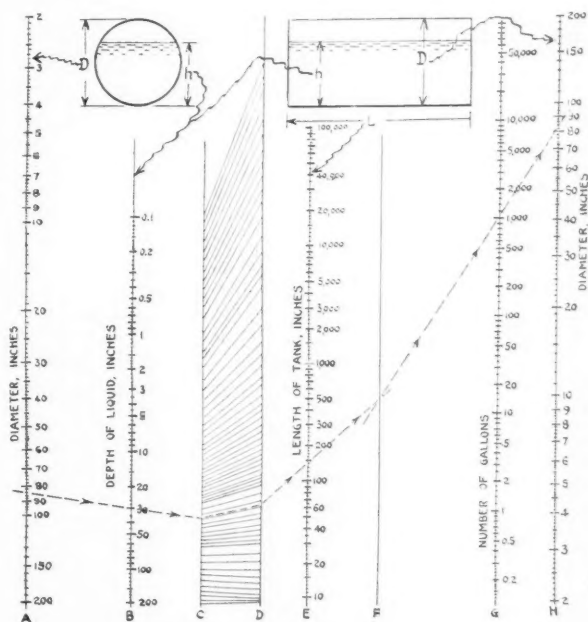
The range of the chart is amply wide. It will take care of any diameter from two to 200 inches, and of any length of tank from 10 to 100,000 inches.

This chart will give an answer much more quickly than tables or formulas. It is more complete than tables because it takes care of every dimension between two inches and 200 inches; whereas tables generally skip many diameters and lengths giving only 24, 28, 32, 34 inches, etc.

To avoid confusion all dimensions are given in inches on the chart below.

Since Column E takes care of lengths of tanks up to 100,000 inches, it is plain that not only will this chart compute tanks, but it will include long pipes wherever it is desired to compute either the full capacity of such pipes or their partial capacity. 100,000 inches is equal to 8,333 $\frac{1}{3}$ feet.

Inversely the chart may be used conveniently for determining the length of tank necessary to hold a given number of gallons where the diameter of tank and depth of liquid are known or fixed quantities as is often the case. The method of applying the chart to problems of this character is so obvious that further directions are deemed unnecessary by the author.



A Broad Nomenclature for Carbon Blacks

Donald F. Cranor¹

THE introduction of new carbons for use in rubber and application of established grades to new uses has led to a confusing terminology. Perhaps it should be said that lack of terminology has led to confusion.

Since entry of the United States into the war, reclaimed rubber has been used more generously in tires, including tread stocks, in order to extend the natural rubber stockpile. This has brought about a considerable use of black of the impingement channel type which is slightly coarser and somewhat less reinforcing than that previously employed in tire treads. The grade in question has long been available for specialized uses and has been referred to within the carbon industry as "soft channel black." However it is unfortunate that rubber compounders have more recently come quite frequently to refer to this type simply as "soft black." Intermediate carbons not made by the channel process are now receiving wide attention. These, and a large group of already established grades, are distinctly coarser than the softest channel black so that it is a matter of some importance to exercise care in the nomenclature.

Thermal Furnace Process Black

The rubber pigment which has longest and most properly been referred to as "soft black" is that made in a furnace by a thermal decomposition process which accomplishes direct cleavage of the hydrocarbon molecule. The first carbon of this class to be developed has a particle diameter of 274 μ and one pound develops a surface area of about one acre. This and others of the same category are extenders rather than reinforcers, and the term "soft carbon" supplies an apt description from the point of view of the compounder. The term "*coarse thermal carbon*" would be technically more accurate, and general use of this designation is suggested.

Fine Thermal Furnace Black. Modification of this process involving gas dilution produces a much finer black (P-33) with particle diameter of 74 μ . Characterized by tensile and tear in natural rubber approaching the reinforcing blacks, but differing sharply by developing low modulus compounds, this type is sometimes referred to as "low modulus black." "*Fine thermal black*," however, affords a better description.

Combustion Furnace Process Black

As far back as the early '20s gas carbon black was produced in a furnace by combustion of natural gas with controlled access of air. This procedure differs essentially from the furnace method described above in that the latter involves a thermal surface action to crack the hydrocarbon molecule; whereas the furnace process employed to produce semi-reinforcing carbons is dependent upon flame. Hydrogen is the by-product of the thermal process, but the through gases are oxides of carbon and water in the combustion operation. Although following the essential flame chemistry of the channel procedure, the combustion furnace method differs radically in that on account of the size of the flame, collection by means other than impingement is necessary.

A typical carbon of this group is Furnex. The particle diameter of 83 μ is only very slightly coarser than the 74 μ diameter of P-33, and the surface area of this group averages in the neighborhood of four acres per

pound. This type is outstanding because it combines important reinforcing effect with high resilience.

Semi-Reinforcing Black. This is an accurate description—much better to use than "furnace black", both because the thermal blacks are actually also furnace blacks and because intermediate types may also be produced by furnace processes. It is a good practice to refer to this type by the convenient abbreviation "*S.R. Carbon*."

Channel Impingement Process Black

Particle size of commercial grades which enjoy large-volume use in industry ranges from an average diameter in the neighborhood of 30 μ all the way down to 13 μ . Surface area provides an even better point of view for consideration of the rubber grades which range from 10 to 12 acres per pound. Specialty grades used for ink and paint range up to 22 acres; the latter figure corresponds to the particle diameter of 13 μ . Having regard for these basic physical differences, it is clearly evident that no black in this category should ever be referred to as a "soft type."

Although several individual producers of impingement channel black now offer a range of grades for rubber which embrace one-half dozen or more separate types, there are three main groups which (if specialties are excepted) account for practically all material of the channel category used in rubber. These are: (1) the finer extra reinforcing, (2) the standard reinforcing, and (3) the coarse or easy processing type.

These can well be distinguished on the basis of available surface area, considering the extra reinforcing type as a "*fine channel*" black since it has a surface area in the neighborhood of 11½ pounds per acre. The standard reinforcing type might then be classed as "*medium channel*" black based on its surface area of from 10½ to 10¾ pounds per acre. Material of clearly coarser particle size, for example, such as possesses a surface area of not more than 10.3 pounds per acre, could properly be distinguished for the other grades by the designation "*coarse channel*" black. On the basis of the foregoing discussion the following line-up is suggested:

Type (Carbon Pigment)	Surface (Lbs. per Acre)	Examples
Coarse Thermal	1.0	Thermax, Shell, etc.
Fine Thermal	4.0	P-33
Semi-Reinforcing ("S.R.")	3.5-4.0	Furnex, Gastex, etc.
Channel Impingement		
Coarse Channel	10.3 or less	Micronex W-6, etc.
Medium Channel	10.5-10.75	Standard Micronex, etc.
Fine Channel	11.5-12.0	Micronex Mark II, etc.

An additional type; namely, special reinforcing furnace carbon, as represented by Statex, is assuming more and more importance. It is, of course, more difficult to employ broad terms when referring to carbons produced by special means, particularly where available types are distinctly unique and exhibit individual characteristics. On the other hand, where several brands fall into clean cut groupings, a generic nomenclature can be developed.

General use of the suggested designations throughout the trade would materially assist in proper discrimination between broad types. Use of such generic terms in service literature of suppliers of other raw materials is desirable from every point of view.

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German Patents Relating to Vinyl Polymers—XII

M. Hoseh

THE preparation of materials insoluble in motor fuels, ordinarily containing benzene, benzene, alcohols and similar solvents, and yet soluble in other solvents, for processing purposes, is revealed in (135). It was found that polyvinyl formate and mixed polymers containing an excess of formate over acrylates are endowed with this property: they dissolve in chlorinated hydrocarbons and ketones, but remain unaffected by the mixture of solvents contained in motor fuel. Because of this property the polyvinyl formate can be made into fuel hose, gaskets, etc.

A new method for polymerizing 2-vinyl furan, described in (136), utilizes an emulsion. Oxygen, substances yielding oxygen, or other suitable substances may be used as promoters. The resulting polymer becomes lighter in color, similar to rubber latex, and is insoluble in ligroin and alcohols, but is soluble in aromatic and chlorinated hydrocarbons, esters, and cyclic bases. Upon the evaporation of the solvent the polymer forms a water- and light-resistant film of good elasticity and adhesion properties. Polyvinyl furan absorbs oxygen and gradually becomes insoluble in its solvents. This action can be prevented by stabilizing its solutions with bases or aromatic hydroxy compounds. The polymer can be worked on hot rolls. Another desirable property is its ability to be mixed and blended with appropriate fillers.

In (137) is reported an improved method for molding plastic masses of hardened urea or thiourea resins. The hardened resin having a spongy structure is comminuted as in a hammer mill and mixed with natural or synthetic binders which have adhesive power and are elastic. Suitable are linoxilin, natural or synthetic rubber, hydrogenated rubber, polyisobutylene, polyvinyl ether, polyvinyl ester, polyacrylates, etc. The mixing can be done either on rolls or in kneading apparatus. Pigments, fillers, plasticizers, etc. may be added if desired. The mixture can be drawn into sheets or molded by pressing. The products are quite elastic and strongly resistant to pressure and tear. They retain their porous structure and are very suitable for floor and wall covering as well as for lining wood, stone, and metal.

Condensation products of naphthalene and cyclohexanol or alkylcyclohexanol make very desirable plasticizers for high-molecular thermoplastics (138). These condensation products may contain substituents as halogens, alkyl, acyl, keto, etc. groups, i. e., cyclohexylnaphthalene, methylcyclohexylnaphthalene, methylcyclohexylacetonephthalene, cyclohexylmethylcyclohexylnaphthalene, cyclohexylchloronaphthalene, and dicyclohexylnaphthalene. They can be used with cellulose derivatives as well as with polyvinyls, polystyrols, and polyacrylates. Their products are freeze resistant.

An improved procedure of the one given in (5)¹ for condensation products of polyvinyl alcohol is described in (139). By this new procedure polyvinyl alcohol or its derivatives containing hydroxyl radicals are condensed

with ketoacetals instead of ketones used in the older process. Suitable are acetodiethyl acetal, methylethylketodipropyl acetal, 4-methoxy-2-butanonedimethyl acetal, acetophenonedimethyl acetal, cyclohexanonedimethyl acetal, benzophenonedimethyl acetal. The condensation is best conducted by dissolving the polyvinyl alcohol or similar OH containing compound and the ketoacetal in a suitable solvent, then heating the solution in the presence of a catalyst. Suitable solvents are either an excess of the ketoacetal or a chlorinated hydrocarbon such as dichloromethane, dichloroethane, carbon tetrachloride, and chloroform. As catalysts can be used HCl, H₂SO₄, trichloroacetic acid, p-toluolsulphonic acid, etc. The heating temperature should not be essentially below 50° C., but should not exceed 130° C. The highly viscous condensation product is thinned with an organic solvent, then emulsified in water with the aid of the Na salt of isobutylnaphthalenesulphonic acid, or isopropylnaphthalenesulphonic acid. The organic solvent is subsequently distilled off; whereupon a white powder is precipitated. This condensation product is quite elastic and resistant to chemical and physical action. It is valuable for the plastics industry and for lacquers.

A valuable leather substitute is obtained from leather waste and polymerization products of unsaturated aliphatic polymerizable compounds (140). The polymerization products are produced by emulsion-polymerization processes. They are insoluble in water. An aqueous dispersion of the polymer is mixed with the leather waste, and the mixture is processed by the usual means, e.g., by rolling or pressing. Plasticizers, fillers, pigments, etc., may be added if necessary.

A method for vastly improving the resistance to light and heat of high polymers containing chlorine is described in (141). The Cl containing polymer or mixed polymer is comminuted and extracted with a solvent that dissolves the low polymers, but does not affect (or affects very slightly) the higher polymers. Suitable solvents are the aliphatic alcohols. The higher polymers, after being freed of the lower constituents, are distinguished by the facts that: films, etc. made from them are water white and colorless; their light resistance is greatly improved; their softening point is appreciably higher; their resistance to heat is greater. It is of interest to note that the discoloration by light and heat is primarily attributable to the lower polymers.

A continuous process for the polymerization of vinyl compounds (142) is eliminating many difficulties associated with the hitherto-employed batch processes. The monomer is fed into a pressure apparatus simultaneously with an aqueous solution or suspension of the emulsifier and the requisite quantities of the catalyst. The apparatus is heated or cooled, as the case may be, to the desired degree. The interrelation of: (1) the rate of feeding the monomer, (2) the rate of feeding the aqueous emulsifier and catalyst, (3) the initial temperature of the reactants, (4) the temperature within the apparatus, and (5) the rate of flow through the apparatus, determines the degree of polymerization. Also in a continuous process the water in the polymer suspension is evaporated in an evaporator and finally completely removed with the aid of a stream of hot air.

Further information on the use of promoters, described

¹ See INDIA RUBBER WORLD, Mar. 1, 1942, p. 571.

in (107)² and consisting of peroxides of fatty acids with at least four C atoms in their molecule, for the polymerization of mixtures of organic vinyl esters and other polymerizable, unsaturated organic compounds, is described in (143). The use of these promoters for such mixtures yields a product with a high degree of polymerization.

A new group of mixed polymers, ketocarboxylic acid polymers, is obtained from the polymerization of alkylidene acetoacetic ester and a polymerizable compound such as vinyl acetate, vinyl chloride, acrylates, etc. (144). The alkylideneacetoacetic esters by themselves have but a very slight tendency to polymerize. When mixed with a polymerizable substance, however, the reaction proceeds without difficulty. It can be conducted with or without thinners or solvents, or in emulsion. The usual promoters, e.g., H_2O_2 , benzoyl peroxide, etc., and regulators such as aldehydes may be used. By introducing various alkylidene radicals into the acetoacetic ester molecule products of widely varying properties are obtained. The introduction of these radicals into the molecule is readily accomplished by condensation with a carbonyl compound.

Homogeneity in a mixture of polyvinyl chloride and a plasticizer is attained by heating the mixture under pressure to a temperature at which, without becoming fluid, the mixture gelatinizes spontaneously (145). The temperature to reach this condition depends on the polymer, the amount of plasticizer used, and, to some extent, on the working conditions. Thus, using a polymer of a medium degree of polymerization, to which is added 20% of a plasticizer, and the mixture is worked on hot rolls, the critical temperature is 130-150° C.; however, adding 50% of the plasticizer, the temperature drops to 110-120° C. The usual plasticizers are used: phosphoric, phthalic, benzoic, adipic, etc., acid esters. The best for any particular use should be determined experimentally. Fillers and pigments may be incorporated. The product is completely resistant to water and aqueous solution, is distinguished by a high temperature resistance, and is a very effective electric insulator.

By adding a slight amount of an aldehyde to the reaction mixture it is now possible to condense high molecular compounds, the functional groups of which are polyvinyl alcohols and ketones and the keto group of which is not a member of a ring (146). For the first group of reactants hydroxyethylated polymerization products of carboxylic acids and saponified mixed polymers of vinylates and vinyl chloride can be used. Suitable ketones are: acetone, 4-methoxy-2-butanone, acetophenone and benzylmethylketone. As for aldehydes, the following may be used: paraldehyde, propionaldehyde, butyraldehyde, benzaldehyde, and furfural. Although 1-2% of aldehyde suffices, the amount may vary to suit the conditions. The reactants, i.e., the compound containing the reactive groups of polyvinyl alcohol, the ketone, and the aldehyde are dissolved in a suitable solvent, and the mixture is treated at 10-30° C. in the presence of catalyst. As a solvent, is used either the ketone or a chlorinated hydrocarbon, e.g., dichloromethane, dichloroethane and CCl_4 . Suitable catalysts are HCl , H_2SO_4 , trichloroacetic acid, *p*-toluol-sulphonic acid, etc. The viscous product is finished as described in (139).

The addition of even very small quantities of antioxidants improves vastly the stability of polyvinyl ethers ordinarily not stable and more or less susceptible to aging

(147). Appropriate compounds for this purpose are those which contain an amino, a sulphidic, or an aromatic hydroxyl group. Among such substances are di-(2-hydroxy-5-butylphenyl) sulphide or bisulphide, phenyl- β -naphthylamine, and condensation products of aldol and α -naphthylamine. The stabilizer can be added as a solid or in solution and also can be added before polymerization.

By recrystallizing phenylvinylketone monomer before polymerization at very low temperatures a polymer is obtained that is clear, soluble, and mechanically strong (148). The hitherto produced polyphenylvinylketone was discolored, insoluble, and brittle; consequently its technical uses were extremely limited. In the improved method the monomeric ketone is dissolved in liquid pentane or any other suitable solvent which is gaseous at ordinary temperatures, and the solution is cooled down to -70° C. At this temperature the ketone separates as silky needles which melt at -11.5° C., while the discolorizing impurities remain dissolved. The polymerization of the purified ketone can be done on the filtered solids. It can be obtained as an aqueous suspension by passing water vapor through the solution, thus distilling over the ketone followed by stabilizing with a colloid and then polymerizing. Finally to the distillate can be added a salt, e.g., $NaCl$ or $CaCl_2$; then the ketone separates in droplets. If polymerized in the latter form, the polymer has a lenticular or globular shape. The polymerization can be conducted along with other polymerizable compounds. The polymer can be die cast.

The process described in (123)³ is also admirably adapted to manufacturing of light reflecting elongated shapes such as rods or bars of plastics (149). The light reflecting properties are imparted by substances such as fish-scale extracts, $HgCl$ lamellae, aluminum bronze, gold bronze, $PbCO_3$, PbI_2 , etc. The problem is to get these substances properly oriented in the medium within which they are incorporated. However, adding these substances to the monomers and polymerizing the latter as outlined in (123) will cause the light reflecting substances to become oriented in the most effective way, i.e., concentrically to the axis of the rod or bar and (the reflecting surfaces) parallel to each other. Various effects can be easily produced by using two or more polymerizable substance of varying viscosity. The reflecting substances distribute themselves differently according to the viscosity of the medium.

Patent References

- (135) No. 677,157. Applied July 26, 1935. Granted May 25, 1939. H. Stark, assigned to I. G. Farbenindustrie, A. G., Frankfurt a.M.
- (136) No. 677,868. Appl. Dec. 5, 1936. Gr. June 8, 1939. W. Bock, to I. G. Farbenindustrie.
- (137) No. 678,305. Appl. July 8, 1936. Gr. June 15, 1939. M. Müller-Cunradi and W. Daniel, to I. G. Farbenindustrie.
- (138) No. 679,128. Appl. June 17, 1936. Gr. July 6, 1939. A. Rieche, H. Behneke, K. Brodersen, and E. Hanschke, to I. G. Farbenindustrie.
- (139) No. 679,792. Appl. June 19, 1936. Gr. July 20, 1939. H. Sönke, to I. G. Farbenindustrie.
- (140) No. 679,825. Appl. June 3, 1933. Gr. July 20, 1939. H. Fikentscher, to I. G. Farbenindustrie.
- (141) No. 679,896. Appl. Nov. 9, 1934. Gr. July 27, 1939. Deutsche Celluloid-Fabrik, Eilenburg.
- (142) No. 679,897. Appl. Nov. 21, 1936. Gr. July 27, 1939. R. Bappert and G. Wick, to I. G. Farbenindustrie.
- (143) No. 679,943. Appl. Feb. 6, 1935. Gr. July 27, 1939. A. Voss and W. Heuer, to I. G. Farbenindustrie.
- (144) No. 679,944. Appl. Aug. 19, 1937. Gr. July 27, 1939. C. Dorfelt and K. Billig, to I. G. Farbenindustrie.
- (145) No. 681,026. Appl. July 27, 1935. Gr. Aug. 24, 1939. G. Wick, to I. G. Farbenindustrie.
- (146) No. 681,346. Appl. June 19, 1936. Gr. Aug. 31, 1939. H. Sönke, to I. G. Farbenindustrie.
- (147) No. 681,374. Appl. July 10, 1936. Gr. Aug. 31, 1939. M. Müller-Cunradi and K. Piersh, to I. G. Farbenindustrie.
- (148) No. 682,557. Appl. Mar. 2, 1935. Gr. Sept. 28, 1939. A. Weihe, to Deutsche Celluloid Fabrik.
- (149) No. 683,983. Appl. May 12, 1937. Gr. Oct. 26, 1939. C. M. Fields and G. A. Wilkens, to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., U. S. A.

(To be continued)

² *Ibid.*, Aug., 1942, p. 460.

³ *Ibid.*, Nov., 1942, p. 471.

A Novel Synchronized Drive for Processing Machines

A. F. Metzger¹ and W. Hansen²

DEFINITELY unusual is a recent application of a power Selsyn system to a rubber processing machine in the plant of the Hood Rubber Co., Watertown, Mass. The use of this Selsyn equipment enables this company to overcome a physical limitation of its building and have a cleaner drive with lower maintenance.

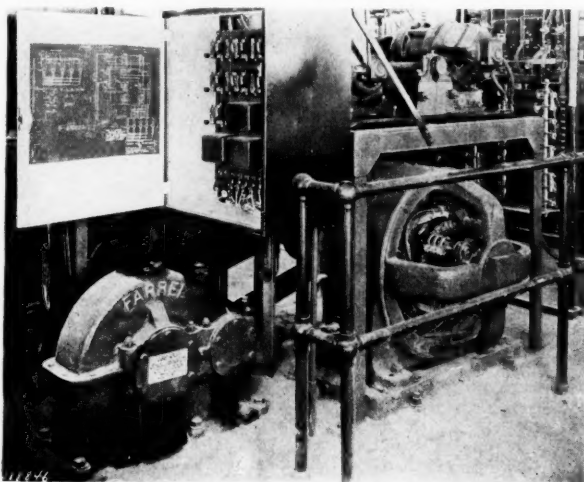
This processing machine takes rubber from a calender on to a conveyer and then through several steps to a cut-off knife where it is cut into convenient lengths. Finally, a short length of belt conveyer delivers it to hand-trucks which carry it to the next state of manufacture.

Two Difficulties

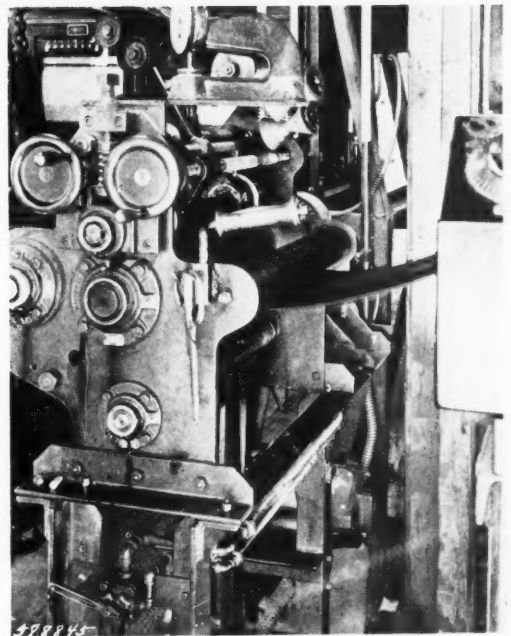
Two problems had to be solved in driving this processing machine. The first had to do with the mechanical requirements of the process; the second with the problem of making the machine fit the building.

Since this is a process where different operations are performed on a strip of continuously moving material, it was necessary to drive all sections at a speed proportional to the speed of the calender. Yet, at the same time, the speed of the entire process had to be adjustable to accommodate different materials, thicknesses, etc. In addition it was imperative that no mechanical strain be put on the material as it has very little strength until after the final curing. Each section of the drive had to be individually adjustable in speed to take care of variable conditions of the stock during that particular part of the

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Installation View in Plant of Hood Rubber Co.: Large Motor Is 50 H.P. D.C. Main Motor for Driving Calender and Conveyer System; Immediately above Is Master Selsyn Transmitter with Selsyn System Sequence and Protection Panel in Foreground



Calender and Beginning of Conveyer at Hood Rubber Plant; Gap between These Permits Fire Door (Right Rear) to Close in Emergency. First Follower Selsyn Is near Bottom of Calender Frame

process. Once the correct relation was established, it had to be maintained at all speeds.

The first requirement could have been met by using a line shaft driven by the calender and driving various follower sections through expanding pulleys. But the second requirement (that of making the machine fit the building) ruled out a line shaft because the space available for the machine required that it be set up in two rooms separated by an automatic fire door. While a line shaft would have been possible, several sections of line shaft and considerable belting would have been required to take the power around the door and through the wall.

Selsyn System the Solution

Because of the physical limitations of the building, a Selsyn drive was employed with the master Selsyn driven by means of a chain from the calender motor and all the follower sections driven by their own individual receiver Selsyns. A gap was left in that section of the conveyer going through the fire door so that in case of fire the door would slide through the conveyer gap, meeting no obstruction save the uncured rubber which would be torn aside.

The characteristics of Selsyns are such that every follower Selsyn will keep its rotor exactly in step with the rotor of the master Selsyn. Thus it is the equivalent of mechanical gearing. Full torque is available at all speeds from the maximum rated speed down to standstill.

On this processing machine each section was made individually adjustable for variable stock conditions by using a vari-pitch sheave and V-belt to transmit the power from each follower Selsyn to the section of the machine it drives.

In successful operation for over a year, this machine has required only slight attention after initial adjustments. The success of the drive indicates that power Selsyns may be used on any machinery operating in tandem where abnormal requirements make the more usual drives impracticable or expensive.

EDITORIALS

New Power Brings New Responsibility

THE rising tide of power in Congress, which will undoubtedly result in its having a stronger voice in shaping national policy, was given concrete expression by Senator O'Mahoney of Wyoming and Senator McCarran of Nevada in recent speeches. There is expressed a strong feeling that in spite of the necessity due to the urgency of the war of Congress delegating a substantial part of its legislative power to the various government bureaus, Congress should exercise a greater watchfulness and cooperate to a greater extent with these bureaus in the use of this power since Congressmen are duly elected representatives of the people; while the bureaucrats hold their positions by virtue of appointments and in making their decisions are influenced by this fact. By means of real cooperation between the bureaus and legislative branches of the government, real progress in our war effort can be made, but if instead of cooperation the policy of the new Congress persists mainly in counteraction, an increasingly dangerous situation will develop.

Senator Gillette of Iowa in recent announcements has expressed the idea that it is necessary to find out what is delaying the rubber program and that the Agricultural Sub-Committee of the Senate, of which he is chairman, plans to question William M. Jeffers, Rubber Director, and other officials of the War Production Board during January to find out "just what the impeding force is." Further along in his public statement Senator Gillette said that the committee would center its attention on what he termed the delay in constructing plants to manufacture alcohol from grain for use in making synthetic rubber. In another statement made in mid-December this Senator stated that "the first half of the cyclone" in the investigation of synthetic rubber production came last spring and that "the other half of the cyclone insofar as this committee is concerned is yet to come." He said further that "this is only a lull between storms." It will be recalled that the passage of the Gillette-Fulmer bill by Congress last July despite its subsequent veto by the President, resulted in the appointment of the Baruch Rubber Survey Committee and, as a result of this report, the establishment of the Rubber Director's Office. The bill itself, if it had been approved by the President or passed over the veto by a two-thirds majority of Congress last summer, would undoubtedly have resulted in a great deal more "confusion and chaos" in the rubber program at that time than Senator Gillette expects to find at the present time.

It is therefore vitally important that this or any other new investigation by Congress of the rubber program proceed with caution in order that any action which may be taken shall not be merely to strengthen the position of any one group or groups' participation in the program

at the expense of the success of the whole program. In his first progress report to Donald M. Nelson, chairman of the War Production Board, Mr. Jeffers states that he has directed the Chemicals Branch of the War Production Board to provide the necessary additional facilities for the production of sufficient industrial alcohol from grain to satisfy the requirements of the butadiene and styrene plants now under construction during the period necessary for the building of new alcohol producing facilities. Mr. Jeffers was assured that the present facilities and stocks are such that with present anticipated needs of alcohol, there is no reason for the WPB to expedite the new facilities at the expense of the plants now under construction. If a Congressional investigation by observers as well qualified to judge the conclusions of the Chemical Branch of the War Production Board on this question as the men who made them can show that the conclusions are not sound, then additional facilities should be provided. If the conclusions are sound and the War Production Board is forced to provide these facilities merely to satisfy the demands of the alcohol group, then counteraction, not cooperation has been the result. Also, it is hoped that the officials of the War Production Board, realizing the extreme importance of preventing any action that will impede the progress of the rubber program, because of their close contact with all its problems, will support any new proposals if they have real merit even though they originate with the Congressional critics of the War Production Board's efforts.

Synthetic Rubber in 1943

GOVERNMENT synthetic rubber, particularly Buna S, will become an actuality as the only rubber available in large amounts to most manufacturers of rubber products during this year. This fact will bring home to any company not intensively engaged in trying to find out how to use these rubbers the need of technical information on the subject. The result should be a new or added appreciation of the work of that section of the Office of the Rubber Director under Assistant Deputy Director E. B. Balcock on technology and specifications for industry uses.

In addition manufacturers of rubber products have a more urgent problem in making sure that they secure promptly a revision upward of the price ceilings they may charge for their products in view of the difference in cost of natural rubber at 22½¢ a pound and the cost of synthetic rubber of 30¢ a pound and up, in order that they may be able to stay in business. It is true that it has been stated that the price of synthetic rubber will be lowered as soon as the effect of mass production of large amounts makes this decrease possible, but will the manufacturers of rubber goods be granted the necessary increase in selling prices for their products soon enough really to compensate for their increased material costs?

What the Rubber Chemists Are Doing

A.S.M.E. Rubber and Plastics Group Holds Annual Meeting

THE annual meeting of the Rubber and Plastics Group of the American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y., was held December 3 at the Hotel Astor, New York, N. Y., as part of the annual meeting of the national society. The morning session dealt with plastics, and the afternoon session was concerned with natural and synthetic rubber.

The first paper of the afternoon session was "Data on Static and Dynamic Fatigue of Rubber" by F. L. Yost, of United States Rubber Co. This paper reviewed work done on this subject, some of which has been previously reported in the literature, and summed up the general dynamic fatigue characteristics of rubber found as a result of work in this field and stated further that the dynamic fatigue life of rubber worked in shear could be related to the dynamic fatigue life of rubber vibrated through linear strains. The dynamic fatigue life had previously been defined as the number of repeated mechanical vibrations necessary to rupture the rubber member. Test data were presented showing the dependence of static fatigue life (time required to rupture under a static load) on load, stock, and temperature. Finally it was shown that both dynamic and static fatigue are ordinarily of importance in practical applications and that allowance for each must be made in choice of working stresses. At the conclusion of Dr. Yost's paper J. H. Dillon, of the Firestone Tire & Rubber Co., presented the results of some work done on the same subject with Buna S rubber.

In the second paper E. G. Kimmich, of the Goodyear Tire & Rubber Co., talked on "Rubber Substitutes" and covered the use of reclaimed rubber, synthetic rubber, and the various plastics being used as replacements for natural rubber. A review of the major synthetic rubbers: Buna S, Buna N, neoprene, "Thiokol," Butyl, Norepol, was given in light of their present and future applications. Mention was made of the increasing use of the elastomer-type plastics as substitutes for rubber and also of the loaded phenolic plastics as temporary substitutes for soft or hard rubber.

The annual progress report on rubber and plastics was given by E. F. Riesing, of Firestone, and Gordon M. Kline, of the National Bureau of Standards. Mr. Riesing explained that the report on rubber was to have been given by John Street, the manager of the Firestone research department, but because of his recent illness the report had not been completed in time for the meeting, but would be available later. Mr. Riesing discussed briefly some of the important developments made in rubber during 1942, referring especially to the bullet-sealing fuel tanks for airplanes, heavy-duty V-belts for tank motors, and pressure sealed cabins for airplanes used at high altitudes.

The progress in plastics during 1942, as

reported by Dr. Kline, emphasized the fact that many of the new developments and uses of plastics were tied in with the war effort and therefore could not be discussed in any detail. He mentioned some specific developments, such as the new plastic developed by the Pittsburgh Plate Glass Co., which has very high abrasion resistance, and also the increasing interest in lignin plastics. Improvements in the injection molding technique for thermosetting resins has resulted in products of more uniform densities and properties, he stated. The speaker referred to the many uses of plastics in replacing metals and other scarce materials in ordnance work and as adhesives for bonding plywood. The possibility of plastic bugles to save metal was mentioned. New developments in testing methods and the large number of contributions

to the literature of the mechanical properties of plastics made during 1942 were emphasized. In conclusion Dr. Kline pointed out that the outlook for post-war uses of plastics was bright in view of the large increase in production volume of these materials which had been made during the past two years.

The three papers given in the morning session on plastics follow: "Mechanical Tests of Cellulose Acetate. Part III," by William N. Findley, University of Illinois, Urbana, Ill.; "Physical Properties of Laminated Plastics," R. W. Barber, St. Regis Paper Co., Trenton, N. J.; and "The Effects of Continued Heating on Mechanical Properties of Molded Phenolic Plastics," D. Telfair, R. U. Haslanger and T. S. Garswell, Monsanto Chemical Co., Springfield, Mass.

Buna S Discussed at R. I. Rubber Club

A MEETING of the Rhode Island Rubber Club, December 4 at the Narragansett Hotel, Providence, R. I., was featured by a talk by Walter J. Geldard, of the Naugatuck Chemical Division of the United States Rubber Co., New York, N. Y., on "Compounding of Buna S." Mr. Geldard began with reference to a statement of the War Production Board made to suppliers of rubber chemicals that they should act to disseminate known information on the compounding of Buna S rubber whenever and wherever possible. Since Buna S rubber is the major synthetic rubber to be produced in the government program and since by the end of 1943 it will be the rubber allocated in most cases for use where natural rubber is now being used, making available information on the compounding and processing of this synthetic rubber is of prime importance, he said. At the same time the speaker mentioned that a large amount of such data has been published in the various journals where it is available for reference.

In discussing the various most important compounding factors, Mr. Geldard emphasized the need of adequate cooling on the mills during breakdown to avoid high, sustained milling temperatures which cause excessive loss of tensile strength of the vulcanizate. He warned that milling alone would not produce a smooth sheet and said that relatively large amounts of liquid or semi-liquid plasticizers or fillers were needed to achieve this result. Many softeners have been tried, and of these Naugatuck rates the heavy coal and pine tar types as the best. However, to date, none of these softeners have produced satisfactory surface tack. For this purpose natural rubber and reclaimed rubber, which are compatible with Buna S in all proportions, may be used.

With regard to the choice and method

of incorporation of fillers, Mr. Geldard pointed out that no pigment other than carbon black has given vulcanizates approaching the 3500 lb/sq. in. tensile strength obtained with this pigment. Carbon black loadings can be built up to 80 parts on 100 parts of rubber with variation in physical properties of cured stocks similar to those obtained with natural rubber for the various types of carbon black. The addition of the carbon black in small amounts and the necessity of obtaining thorough dispersion before making any further additions of this pigment, if maximum physical properties are to be obtained, were emphasized.

Also, to secure maximum tensile strength and other physical properties, sulphur must be added early in the mix or by remilling after cooling. The amounts necessary for vulcanization are low, but for hard rubber compounds the sulphur content may be varied up to 50 parts, he said. The thiazoles, thiurams, and the dithiocarbamates are considered the best accelerators for Buna S since they all give a rather flat cure curve. Curing temperatures show decided optima so that a range must be evaluated in all cases. Further antioxidant beyond that already present in the crude Buna S does no harm, but is not generally necessary.

It was brought out that stocks must be processed soon after final milling, or remilled after cooling; otherwise this is another place where the final tensile strength will be lowered. Open mill or Banbury mixing cycles similar to those for natural rubber were recommended, provided the Buna S had been premilled. Regarding uses, it was stated that most of the work to date has been on tires, and with the small sizes compounding and processing have been quite well worked out. For wire insulation Buna S has been

quite satisfactory despite the fact that since carbon black could not be used for reinforcement, the physical strength of the insulation compounds was lower than with natural rubber. Considerable work has been done with Buna S in footwear; the main difficulty here is the high shrinkage factor which requires high plasticizer and filler content, to permit good processing.

The physical testing of Buna S compounds has been done with the methods used for natural rubber compounds, and these have been found generally applicable in most cases. Abrasion tests have been very useful, but because of the slow recovery of Buna S stocks on stretching, flex tests, particularly at high frequencies, have not been successful. The poor tear resistance of the Buna S stocks leads to rapid failure after the first crack develops. With artificial aging, it was stated, Buna

S gives as good or better results than natural rubber.

In conclusion, Mr. Geldard mentioned that the GSR Buna S from different producing plants is being standardized and should show less variation in factory processing from batch to batch than #1 smoked sheet.

Candidates submitted by the nominating committee, all of whom were unanimously elected for the coming year, follow: president, Lowell K. Morrell (Anaconda Wire), secretary-treasurer, Owen Lowe (Dyrol Rubber), executive committee, L. K. Youse (Firestone), chairman, S. J. Lake (Respro), Daniel Rhee (Carr Mfg.), M. J. Linn (Xylos Reclaiming), J. M. Scott (Henry L. Scott), H. E. March (Goodyear Footwear), F. S. Bartlett (U. S. Rubber), and W. Linnell, Sr. (Collyer Insulated Wire).

Raw Material Supplies for Plastics Manufacture

IN A paper before the National Chemical Exposition and National Industrial Chemical Conference at the Hotel Sherman, Chicago, Ill., November 25, Ralph H. Ball, chief of Organic Plastics and Resins Section, Materials Division, Chemical Branch, WPB, Washington, D. C., gave a very comprehensive review of raw material supplies for plastic manufacture. Mr. Ball explained the limits on these materials that had been set up under plastics control in the WPB Chemical Branch; his section had excluded natural resins and the protective coating synthetics such as alkyds and also the synthetic rubbers, as Buna, Butyl, "Thiokol," neoprene, and vistanex. This exclusion left the plastics control responsible for the tar-acid resins and plastics, the urea and melamine resins, the cellulose esters and ethers, the acrylate and methacrylate resins, polystyrene, and the vinyl family of resins. The majority of these plastics are available in insufficient quantity to meet war and essential civilian needs, and many of them are inadequate in supply to meet war uses alone. Two major factors are responsible for these shortages, the speaker said, production facilities for the plastics themselves, and raw materials for their synthesis.

With regard to facilities, it was pointed out that we have reached a stage in our war economy where the plants already in production and those still building require so much metal, equipment, and skilled manpower that practically no new plans for construction can be considered. Most of the raw materials for plastics are shared with other segments of the chemical industry, and with most of our chemicals there is not enough to supply all demands. Therefore ability to get adequate quantities for plastics production depends largely on whether or not the uses to which the plastics are being put are more important to the prosecution of the war than other competing uses for the same raw material.

In discussing the raw materials or production problems for the various plastics, Mr. Ball first covered the phenolics, which he said, although they had been able to

take care of the essential military needs, had not succeeded so well in supplying the minimum non-military requirements. Supplies of cresol and cresylic acid had been strained by combined military needs for cresol-formaldehyde plastics and for tricresyl phosphate as a plasticizer.

The urea-formaldehyde resins and plastics have not presented any serious supply problem as yet, and the productive facilities for the resins and raw materials have been ample to meet essential demands and could take care of a substantial expansion in output. Restriction on unessential civilian uses of these plastics has been necessary in order not to squander ammonia necessary for the production of urea in unessential plastic items. The melamine resins were somewhat slow in finding a volume of war uses, but at present numerous such uses are being established, Mr. Ball declared, and a shortage of these resins was threatened.

The oldest of the plastics, nitrocellulose, and one which still has considerable military usage was quite freely available until recently when production had to be curtailed because of a shortage of nitric acid. This plastic will be available only for highly essential uses, and production will remain at the present reduced scale. Cellulose acetate, still being produced in large volume, is one of the most available thermoplastics. Some difficulty had been experienced in obtaining enough plasticizers, especially the phthalate and phosphate esters, but the future problem is to maintain an adequate supply of acetic anhydride and cotton linters. Cellulose acetate butyrate is only limited by production facilities and possibly competing requirements for cotton linters for other products. Cellulose acetate-propionate is available only for important war uses; the supply also is limited by production facilities and the unavailability of propionic acid. Ethyl cellulose has found a wide variety of important war uses, both as a plastic and a coating material, which have grown to such a volume that much difficulty is experienced in supplying them. The supply problem is en-

tirely a question of production facilities, Mr. Ball stated.

Methacrylate resins constitute one of the most critical plastics from the point of view of supply and important war uses. The difficulty is entirely a matter of plant facilities, and new plants are under construction. The same situation to a lesser degree prevails for the acrylate resins.

The exceptional properties of polystyrene, such as zero water absorption, chemical resistance, and unusual electrical properties, have resulted in important war uses. Supplies for these uses are adequate, but because polystyrene shares its raw material with synthetic rubber, it is not expected that polystyrene will be available for anything but war uses for at least a year.

The vinyl family of resins is filling an extremely important role in war production but despite expanded facilities, it is not possible to meet the military demand. Many of these resins can serve very well as rubber replacements and are being used as such. In the case of polyvinyl chloride, the supply problem is one of production capacity and plasticizer availability. Vinyl chloride-acetate copolymer is being used mainly for military coated fabric, and since the supply cannot satisfy the demand, polyvinyl butyral had to be provided also to meet the demands. Polyvinyl formal and butyral are both being produced at full capacity; yet the supply is insufficient to meet war needs. Production facilities, not raw materials, are the limiting factor. Polyvinyl alcohol and acetate have adequate production facilities, but there is a deficiency of supply of the vinyl acetate monomer. This shortage is due to inadequate plant facilities. Because of the interdependence of these resins on vinyl acetate monomer, they must all be regarded as equally scarce.

In the case of many of these plastics, Mr. Ball stated, the properties which make them valuable would not be developed except for the plasticizers that are an integral part of the composition. In general, the problem of plasticizers has been met adequately by substituting the more available for the scarce plasticizers, except in the case of those plastics, such as cellulose acetate, where the choice of plasticizers is very limited.

To summarize the supply position, he said, we might divide the plastics into three groups: (1) those available in fairly good quantity for civilian use; (2) those highly restricted even for military use; and (3) those which fall in between the first two groups. In the first and most available group are urea-formaldehyde, cellulose acetate, and cellulose acetate butyrate. In the second and least available group are cresol-formaldehyde laminates, the methacrylates, and the vinyl resins. The other plastics may be put in the intermediate group, with several of them already headed for the critical category.

In conclusion, Mr. Ball gave a word of warning as to the availability for civilian uses of the first group and stated that it would be hazardous to promote new civilian uses of these plastics which are of questionable importance in a wartime economy.

A. C. S. Rubber Division Activities

Chicago Group Celebrates

THE Chicago Group, Rubber Division, A. C. S., celebrated the 1942 Christmas season with its annual dinner dance held December 18 in the Terrace Casino of the Morrison Hotel, Chicago, Ill. The affair was attended by about 325 members, their wives and guests, who, after an excellent dinner, were entertained by six acts of vaudeville. After this entertainment President Calvin Yoran presented James P. Sheridan, (N. J. Zinc) chairman of the Christmas Party Committee, who distributed favors to all the ladies. Here Herbie Mintz and his orchestra took over with dancing.

Other members of the party committee were:

Robert C. Gunther (Inland Rubber), co-chairman, Daniel Siefer (Diamond Wire & Cable), George Gates (Victor Mfg. & Gasket), J. T. Adams (Sears Roebuck), and Wm. Crumpler (George Mephan Co.).

The Chicago Rubber Group and the Christmas Party Committee wish to thank the following suppliers and manufacturers, whose generous donations made the party possible:

Union Asbestos & Rubber Co., Williams-Bowman Rubber Co., Binney & Smith Co., Titanium Pigment Corp., Bibb Mfg. Co., Armstrong Tire & Rubber Co., International Smelting & Refining Co., Standard Chemical Co., Servus Rubber Co., Farrel-Birmingham Co., Inc., Western Felt Works, W. H. Salisbury & Co., Commerce Petroleum Co., American Zinc Sales Co., Herron & Meyer, Rohit, A. Atwood, Industrial Rubber Goods Co., Cleveland Liner & Mfg. Co., Frost Rubber Works, Diamond Wire & Cable Co., L. Albert & Son, National Rubber Machinery Co., H. Muehlstein & Co., Inc., Inland Rubber Corp., Chicago Rubber Clothing Co., Dryden Rubber Co., G. C. Maassen, General Atlas Carbon Division, Dicolite Co., Rubber Age, La-Jone Rubber & Mfg. Co., Advance Solvents & Chemical Corp., Marbon Corp., Rex-Hide, Inc., J. M. Huber, Inc., Sears, Roebuck & Co., Callaway Mills, Darling & Co., Wishnick-Tumpey, Inc., Wear-Proof Mat Co., Kraft Chemical Co., Chicago Belting Co., Ideal Polter & Mfg. Co., Auburn Rubber Corp., Continental Carbon Co., National-Standard Co., Midwest Rubber Reclaiming Co., Carter Bell Mfg. Co., Pequanoe Rubber Co., Van Cleef Bros., U. S. Rubber Reclaiming Co., Geo. S. Mephani Corp., Cupples Co., Thiokol Corp., Maywood Mold & Machine Co., C. P. Hall Co., Nautagatuck Chemical Division, American Reservoirs Chemical Corp., Stanco Distributors, Inc., Monsanto Chemical Co., Rapid Roller Co., Baker Perkins, Inc., American Container Corp., Roth Rubber Co., Great Lakes Solvents, Moore & Munger, Goshen Rubber & Mfg. Co., R. W. Greeff & Co., E. I. du Pont de Nemours & Co., Inc., Hycar Chemical Co., New Jersey Zinc Sales Co., United Carbon Co., Philadelphia Rubber Works, Genske Bros., and Sun Oil Co.

At the next meeting of the Chicago Group, to be held February 12, Arthur M. Neal, of E. I. du Pont de Nemours & Co., Inc., will speak on accelerators and Buna S.

Buffalo Group Celebration

THE Buffalo Group, Rubber Division, A. C. S., held its Christmas party at the Hotel Westbrook, Buffalo, N. Y., December 16. Entertainment for the 78 members and guests in the form of a musical show under the direction of Buffalo's genial Art Leard was provided both during and after the dinner. Election of officers for 1943 and

distribution of prizes completed the evening.

The new officers elected for the coming year are: Burt W. Wetherbee (Globe Woven Belting Co.), chairman; Howard L. Wiley (U. S. Rubber Reclaiming Co.), vice chairman; and Norman J. Cyphers (Hewitt Rubber Co.), secretary-treasurer. J. M. Cranz, H. E. Elden, and John S. Plumb form the executive board.

In becoming a member of the executive board, John Plumb (U. S. Rubber Reclaiming) retires from a post of chairman which he has held ever since the formation of this Group a few years ago. Under his guidance the Group has grown to a paid membership of over 160. During Mr. Plumb's first term was inaugurated the yearly international meeting held at Niagara Falls, Ont., jointly with Canadian rubber chemists on or about May first of each year.

The new chairman, born and reared in New Hampshire, is manager of research of the Globe Woven Belting Co. Mr. Wetherbee has been active in the Group since its formation and surveyed the Buffalo area by questionnaire to determine the possibilities for a rubber group in that section prior to its actual formation. He also served as secretary-treasurer and during 1942 was vice chairman.

A large number of attractive prizes distributed at the party were made possible by the generosity of the following firms:

Akron Chemical Co., L. Albert & Son, American Cyanamid & Chemical Corp., Binney & Smith Co., Godfrey L. Cabot, Inc., Callaway Mills, J. M. Cranz Co., Chevrolet Gear & Axle Division, Continental Carbon Co., Farrel-Birmingham Co., Inc., Hercules Powder Co., Hycar Chemical Co., India Rubber World, International Smelting & Refining Co., James O. Meyers Co., F. F. Myers Co., Monsanto Chemical Co., H. Muehlstein & Co., Inc., New Jersey Zinc Co., Philadelphia Rubber Works Co., Pequanoe Rubber Co., Rolls Chemical Co., Rubber Age, A. Schulman, Inc., Henry L. Scott Co., Stanco Distributors, Inc., Standard Chemical Co., Thiokol Corp., Titanium Pigment Corp., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., American Zinc Sales Co., and Nylas Rubber Co.

On February 18 the Buffalo Group will hold a joint meeting with the Western New York Section, A. C. S., in Niagara Falls, N. Y. Dinner is scheduled for 6:30 p.m., to be followed by a Kodachrome movie on manufacturing steel, released by the U. S. Steel Corp. The main event, however, will be a talk on "Wartime Rubber" by D. S. Le Beau, research chemist at Massachusetts Institute of Technology, where she is closely associated with Dr. Ernst Hauser working on synthetic rubber and reclaiming.

The Buffalo Group also plans participation in the International Meeting to be held April 30 in Niagara Falls, Ont., Canada, with the Canadian Chemical Association.

New York Group Christmas Party

THE New York Group, Rubber Division, held its annual Christmas party December 18 at the Building Trade Employers Assn. Clubrooms, 2 Park Ave., New York, N. Y., and an unusually large

number of members and guests (460) were present to witness one of Walter Grote's highly entertaining and expertly rendered presentations of magic. A faultless sequence of original and bewildering effects and deftly extracted laughs earned him the enthusiastic applause of the audience. Dinner preceded by a cocktail hour was followed by the election of 1943 officers and also an announcement by F. E. Traflet, the retiring chairman, of members of the New York Group now serving in the Armed Forces. The names of these men with their past and present connection follow:

J. L. Buckley, (U. S. Rubber), Reading Air School, Reading Municipal Airport, Reading, Pa.
Capt. D. E. Cable, (U. S. Rubber), Chemical Warfare Service, 5530 Nevada Ave., N.W., Washington, D. C.
Lt. Commander William Y. Duncan, Jr., (Akron Standard Mold Co.), U. S. Navy, LeRoy Dyal, (George Kaolin Co.), Air Cadet, Moody Field, Valdosta, Ga.
Lt. J. R. Grade John M. Hamilton, (Binney & Smith), N.T.S., (1) N.A.S., Quonset Point, R. I.
Major L. H. Hitchcock, (General Electric), U. S. Signal Corps, Bldg. 271, Apt. 5, Fort Monmouth, Red Bank, N. J.
Lt. Col. B. J. Lennon, (U. S. Rubber), Chief Rubber Unit, Development Branch, Room 1023, Fisher Bldg., Detroit, Mich.
Corp. Charles G. MacDonald, (R. T. Vanderbilt), Co. "E", Second Regiment, Camp Siebert, Ala.
Capt. F. J. Maywald, Assistant Signal Officer, First Interceptor Command, Mitchell Field, Long Island, N. Y.
Capt. Henry P. Pryor, (R. T. Vanderbilt), Anti-Aircraft Artillery School, Officer Candidate Div., AA Gun Firing Section, Camp Davis, N. C.
Sherman S. Rogers, H. Q. & H. Q. Co., 1229 R. C., Fort Dix, N. J.
Lt. J. R. Grade D. C. Scott, Jr., (Henry L. Scott Co.), Bureau of Ships, Washington, D. C.
H. M. Walter, (Container Co.), Seymour Johnson Airfield, Goldsboro, N. C.

Officers elected for 1943 are: chairman, J. H. Ingmanson (Bell Telephone Lab.); vice chairman, F. S. Conover (Nautagatuck); sergeant-at-arms, J. Breckley (Titanium Pigment); secretary-treasurer, B. B. Wilson (INDIA RUBBER WORLD). The executive committee members for the three-year term include: W. B. Dunlap, Jr. (Lee Tire & Rubber); D. A. Comes (Farrel-Birmingham); A. H. Eufer (Vanderbilt); F. E. Traflet (Pequanoe), retiring chairman, and Peter P. Pinto (Rubber Age) will serve as *ex-officio* members of the committee.

The distribution of a large number of unusually attractive and worthwhile gifts to the holders of the lucky numbers, which event concluded the evening's entertainment, was made possible by the generosity of the following firms:

Advance Solvents & Chemical Corp., Akron Standard Mold Co., L. Albert & Son, American Cyanamid & Chemical Corp., American Resinose Chemical Corp., Anaconda Sales Co., Barrett Div., Allied Chemical & Dye Corp., Binney & Smith Co., Black Rock Mfg. Co., Godfrey L. Cabot, Inc., Callaway Mills, Carter Bell Mfg. Co., Cleveland Liner & Mfg. Co., Continental Carbon Co., E. I. du Pont de Nemours & Co., Inc., Farrel-Birmingham Co., Inc., Flintkote Co., General Atlas Carbon Div., General Properties Co., Inc., Givaudan-Delawanna, Inc., C. P. Hall Co., J. M. Huber, Inc., Hycar Chemical Co., INDIA RUBBER WORLD, I. F. Kleinert Rubber Co., Midwest Rubber Reclaiming Co., Monsanto Chemical Co., Moore & Munger, H. Muehlstein & Co., Inc., National Rubber Machinery Co., National Sherardizing & Machine Co., Nautagatuck Chemical Div., United States Rubber Co., New Jersey Zinc Co., Pequanoe Rubber Co., Philadelphia Rubber Co., Philadelphia Rubber Works Co., Pittsburgh Plate Glass Co., Rare Metal Products Co., Revortex Corp. of America, John Royle & Sons, Rubber Age, St. Joseph Lead Co., A. Schrader's Son, A. Schulman, Inc., Henry L. Scott Co., Southwark Mfg. Co., Stamford Rubber Supply Co., Stanco Distributors, Inc., Standard Chemical Co., Stauffer Chemical Co., Sun Oil Co., Textile

Proffers, Inc., Thiokol Corp., Thompson, Weinman & Co., Inc., Titanium Pigment Corp., United Carbon Co., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., Vansul, Inc., C. K. Williams & Co., Wilmington Chemical Corp., Wisnuck-Tumpeper, Inc., and Nylor Rubber Co.

Boston Group Meeting

THE Boston Group, Rubber Division, A. C. S., numbering 184 members and guests, met December 11 at the University Club, Boston, Mass., to hear Carl Sweitzer and Harold Braendle, both of Columbian Carbon Co., New York, N. Y., discuss the subjects "pH Surface Area and Structure of Carbons" and "Carbon Reinforcement of Synthetic Rubbers." Both speakers were introduced by Charles R. Haynes, of Binney & Smith Co., New York.

Also on the program was a colored travelogue picture and lecture on "Wanderings in the Peruvian Andes" by H. Robinson.

The Group then elected the following officers for 1943: Chairman, Lawrence R. Clarke (Haartz-Mason Grower Co.); vice-chairman, Joseph L. Haas (Hodgman Rubber Co.); secretary-treasurer, Harry A. Atwater (Hood Rubber Co.); executive committee, L. D. Ackerman (Converse Rubber Co.) and J. Geenty (Reading Rubber Co.).

About 70 prizes, including War Stamps, were awarded holders of lucky numbers, through the generosity of:

L. Albert & Son, American Cyanamid & Chemical Corp., American Resinous Chemicals Corp., American Zinc Sales Co., T. C. Ashlev & Co., J. T. Baker Chemical Co., Carter Bell Mfg. Co., Binney & Smith Co., Stewart Bolling & Co., Inc., Boston Group, Boston Woven Hose & Rubber Co., Brockton Machine Co., Godfrey L. Cabot, Inc., D. R. Campbell Machine Co., Cleveland Liner & Mfg. Co., Continental Carbon Co., Converse Rubber Co., James Cunningham, James B. Cunningham Co., Dicalite Co., E. I. du Pont de Nemours & Co., Inc., Wm. D. Eggleston Co., Eustis, Pennock & Co., H. T. Feinberg & Sons, Inc., C. E. Gale Co., General Atlas Carbon Division, General Electric Co., Hind & Conner, Inc., Hodgman Rubber Co., Hood Rubber Co., J. M. Huber, Inc., Ralph Huber Co., Hycar Chemical Co., Imperial Paper & Color Corp., Innes-Spender & Co., Ernest Jacoby & Co., Krebs Pigment & Color Corp., D. H. Litter Co., Inc., Mallinckrodt Chemical Works, Malrex Chemical Co., Monsanto Chemical Co., H. Muehlstein & Co., Inc., Nanga-tuck Chemical Division, New Jersey Zinc Co., Niagara Sprayer Co., A. C. Nispel, Inc., Panther-Panco Rubber Co., Pequannoc Rubber Co., Philip Bros., Inc., Plymouth Rubber Co., Inc., The Rubber Age, Sanford Mills, A. Schrader's Son Division, A. Schulman, Inc., Henry L. Scott Co., Simplex Wire & Cable Co., Stamford Rubber Supply Co., Stanco Distributors, Inc., Thiokol Corp., Wm. R. Thrope & Sons Co., Titanium Pigment Corp., Turner Halsey Co., Tyer Rubber Co., United Carbon Co., R. T. Vanderbilt Co., Inc., Vansul, Inc., Weller Chemical Co., L. G. Whittemore, Inc., Charles T. Wilson Co., Wisnuck-Tumpeper, Inc., Nylor Rubber Co.

Detroit Group Meets

ON DECEMBER 11, Detroit Rubber & Plastics Group, Inc., held its Christmas party at the Detroit-Leland Hotel, Detroit, Mich., attended by about 200 members and guests, many of whom received door prizes which had been donated by rubber and plastics manufacturers and associated vendors. Speaker of the evening was M. A. Clark, of the War Manpower Commission, and former director of personnel at the United States Rubber Co. plant in Detroit, who discussed the functions of the Commission.

Carbon Black Production and Sales¹

THE year 1941 proved profitable for the carbon black industry, which enjoyed a new high in production and sales. Even of the war, exports continued to drop, but domestic sales swelled considerably. When the rubber shortage began to affect the market, other defense industries took up the slack, and a 30% decline in producers' stocks between January 1 and December 31 resulted. Prices rose on April 1 and July 1, 1941, held firm until January 1, 1942, then rose again.

Although the channel process is still the leading production method, the Lewis, roller, "special," and thermatomic are gaining popularity; they produced 18% of the 1941 output, against 14% in 1940 and 12% in 1939. The principal gain was made by the furnace or high-yield blacks; thus the average yield rose to 1.63 pounds a thousand cubic feet of gas used in contrast to 1940's 1.54 pounds.

In 1941, 49 plants were in operation; 51 in 1940. Two new plants were built in 1941, and four that produced in 1940 were not operated in 1941. Location, capacity of plants, and export figures cannot be revealed.

The use of carbon black is increasing in reducing glare on airport runways, in making black-out materials, and for military purposes. But in 1941, as in former years, the rubber industry was the largest user,

consuming almost 90% of domestic sales. In 1941, 644,744,000 pounds of carbon black were sold, compared with 529,774,000 pounds the year before. Domestic sales increased in all major classes except those to paint companies. Sales were divided as follows: rubber companies 439,502,000 pounds; ink companies, 28,198,000 pounds; paint companies, 5,840,000 pounds; miscellaneous purposes, including three months' exports, 58,469,000 pounds.

According to the Bureau of Foreign and Domestic Commerce, the consumption of rubber, both at home and abroad, rose sharply in 1941, when a new peak was reached in the United States with substantial gains in all three types—crude, reclaimed, and synthetic. The Rubber Manufacturers Association statistics reveal that the percentage of decrease in stocks for 1941 far outweighed the gain in number of tire casings produced. Evidently the war has made an increased demand on other branches of the rubber industry that use carbon black. The growing use of retread for tires is reflected in a sharp rise in camelback production. As this has a relatively high carbon-black content, it probably was a contributing factor to the 42% gain in the amount of carbon black sent to rubber companies in 1941.

Exports for the first nine months of 1941 (the only months available) totalled 112,734,841 pounds, value \$5,104,509, a marked decline from 1940 figures. An average value of 4.53¢ in 1941 and 4.38¢ in 1940 is shown. Imports of gas black

(Continued on page 397)

SALIENT STATISTICS OF CARBON BLACK PRODUCED FROM NATURAL GAS IN THE UNITED STATES, 1937-41

	1937	1938	1939	1940	1941
Number of producers reporting	24	24	22	22	21
Number of plants	57	55	49	51	49
Quantity produced:					
By states and districts:					
Louisiana	66,381,000	39,534,000	51,734,000	55,610,000	78,050,000
Texas:					
Panhandle district	405,247,000	382,369,000	410,130,000	423,908,000	415,001,000
Rest of State	15,821,000	34,735,000	43,044,000	55,987,000	65,211,000
Total Texas	421,068,000	417,104,000	453,174,000	479,895,000	480,212,000
Other States	23,157,000	20,401,000	20,258,000	33,287,000	35,803,000
Total United States	510,606,000	477,039,000	525,166,000	568,792,000	594,065,000
By processes:					
Channel process	444,427,000	441,284,000	464,588,000	491,765,000	487,967,000
Other processes*	66,179,000	35,755,000	60,578,000	77,027,000	106,098,000
Stocks held by producers Dec. 31	100,497,000	166,159,000	130,792,000	169,587,000	118,847,000
Losses	76,000	465,000		223,000	61,000
Quantity sold:					
Domestic deliveries:					
To rubber companies	269,584,000	217,231,000	316,621,000	310,179,000	439,502,000
To ink companies	18,116,000	14,131,000	21,929,000	24,159,000	28,198,000
To paint companies	6,159,000	4,229,000	6,382,000	6,806,000	5,840,000
For miscellaneous purposes	11,503,000	7,883,000	11,773,000	11,012,000	158,469,000
Total domestic deliveries†	305,362,000	243,474,000	356,705,000	352,156,000	532,009,000
Export	184,233,000	167,968,000	203,828,000	177,618,000	112,735,000
Total sold	489,615,000	411,442,000	560,533,000	529,774,000	644,744,000
Value (at plants) of carbon black produced:					
Total	\$17,389,000	\$11,486,000	\$12,857,000	\$16,510,000	\$19,341,000
Average per pound	3.41	2.41	2.45	2.90	3.26
Estimated quantity of natural gas used	341,085,000	324,950,000	347,270,000	368,802,000	365,377,000
Average yield of carbon black per M cubic feet	1.50	1.47	1.51	1.54	1.63
Average value of natural gas used per M cubic feet	1.26	.89	.94	1.00	1.13

*Lewis, roller, "special," and thermatomic.

†Exports for October to December, 1941, included under "Miscellaneous purposes" to avoid disclosing export figures.

‡Figures cover January to September, inclusive.

STANDARD MICRONEX

THE
FAST CURING
GOOD PROCESS-
ING, MEDIUM
CHANNEL
BLACK

MICRONEX

A
COLUMBIAN
COLLOID



BINNEY & SMITH CO. • COLUMBIAN CARBON CO.

DISTRIBUTOR

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STANDARD MICRONEX

Designed to impart maximum reinforcement consistent with high speed processing, Standard Micronex represents balance in rubber black. Presenting an available surface of more than 10 acres per pound the use of Standard Micronex assures adequate reinforcement in combination with fast curing, good processing and only moderate heat build-up.

Users of Standard Micronex have found it entirely practical for compounding with reclaimed and synthetic rubber. Where cure retardation must be avoided, as with Butyl rubber, the fast vulcanizing properties of a black such as Standard Micronex are quite essential.

FURNEX

Contributes — High loading capacity • Easy and smooth processing • Improved aging • Low hysteresis • Resilience and notable extensibility

STATEX

*Develops — Reinforcement — equal to Standard Carbon Black
Cool Running — due to high rebound and less hysteresis • Better
Curing — high pH promotes vulcanizing • Electrical Conductance—essential in airplane tires and other military specialties.*

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UNITED STATES

New Company Formed to Make Synthetic Rubber

The Rubber Reserve Co., Washington, D. C., has made a contract with the National Synthetic Rubber Corp. to operate a new government-owned synthetic rubber plant to be built in Kentucky by the Defense Plant Corp., a subsidiary of Reconstruction Finance Corp., Secretary of Commerce Jesse H. Jones announced December 3. The plant is expected to be completed about June, 1943, and its output will be made generally available and allocated by the government, together with the products of other government-owned synthetic rubber plants.

Formed for the specific purpose of operating this new plant, the National Synthetic Rubber Corp. is owned jointly by five long-established rubber companies which manufacture a wide variety of products ranging from tires to coated abrasives and including scores of articles of vital importance to the war effort. These companies are Goodall Rubber, Inc., and Hamilton Rubber Mfg. Co., both of Trenton, N. J.; Hewitt Rubber Corp., Buffalo, N. Y.; Lee Rubber & Tire Corp., Conshohocken, Pa., and Minnesota Mining & Mfg. Co., St. Paul, Minn.

National Synthetic Rubber Corp. represents a cooperative move among the independent rubber companies as a consequence of the war and the loss of crude supplies from the Far East. Although the companies are competitors, they have pooled substantial amounts of capital and provided a technical staff to manage the new synthetic rubber plant. The working capital and executive and technical staff are supplied to National Synthetic Rubber by the five sponsoring companies in approximate proportion to their respective size and range of operations. All have contributed important technical developments in various specialized fields, especially in the production methods for rubber products.

Minnesota Mining, the largest company in the National Synthetic group, operates four plants producing products such as rubber-bonded abrasives and industrial adhesive tapes of many types now widely used in the aircraft industry. One of its subsidiaries, Inland Rubber Corp., operates a tire manufacturing plant in Chicago, Ill. Lee Rubber's tire manufacturing plant at Conshohocken and its Republic Rubber Division at Youngstown, O., for many years an important producer of industrial and automotive rubber products, including power and conveyor belting and hose of practically every kind, now also are producing numerous military and naval products on government orders. Hewitt Rubber, with two plants at Buffalo, is one of the country's largest producers of conveyor belting and many types of industrial hose; one of its plants now employing more than 1,000 persons is currently given over entirely to the production of military aircraft products. Goodall Rubber and Hamilton Rubber, both of which have been in business



W. W. Benner

for more than 50 years, are large producers of fire hose, petroleum hose, belting, and other industrial rubber products.

The president of National Synthetic Rubber is W. W. Benner, of Lee Rubber; while B. J. Oakes, of Minnesota Mining, is executive vice president and general manager in charge of operations at the plant. William M. Collins, Jr., also of Minnesota Mining, is vice president and treasurer, and B. J. Moffatt, of Hewitt, is a vice president. E. H. Letchworth, of the Buffalo law firm of Kenefick, Cooke, Mitchell, Bass & Letchworth, will serve as secretary. Directors are Albert A. Garthwaite, of Lee, chairman of the board; Thomas Robins, Jr., of Hewitt, vice chairman; and W. L. McKnight, Mr. Collins, and John L. Connolly, of Minnesota Mining; Mr. Benner and Henry Hopkins, Jr., of Lee; B. T. Moffatt, of Hewitt; Henry N. Young, Jr., and A. Boyd Cornell, of Hamilton Rubber; and F. B. Williamson, Jr., of Goodall Rubber.

Ickes Petroleum Administrator

President F. D. Roosevelt on December 2 issued Executive Order 9276 "Establishing the Petroleum Administration for War and Defining Its Functions and Duties", whereby Secretary of the Interior Ickes, who had been serving as Petroleum Coordinator for War, is made Petroleum Administrator for War and he is authorized to order rationing of petroleum products in areas where shortages exist. The order also states that:

"The Administrator shall perform the functions with respect to rubber conferred upon the Office of Petroleum Coordinator for War by Executive Order No. 9246 of September 17, 1942,¹ subject to such direc-

tives as the Rubber Director may issue pursuant to such order. Nothing in this order shall apply to or in any way limit the functions and authority, or the manner of executing the same, of the Chairman of the War Production Board or the Rubber Director in the exercise of control over and administration of the Nation's rubber program pursuant to said Executive Order No. 9246, or the functions and authority of any department, establishment or agency in the execution of such aspects of the rubber program in such manner and for such period of time as the Rubber Director may direct pursuant to said Executive Order."

Jeffers Committee to Russia

Rubber Director William Jeffers has appointed an American Rubber Mission in the Soviet Union to collect information about Russian chemical and engineering experience in manufacturing synthetic rubber. Head of the group is Ernest W. Pittman, president of Interchemical Corp., New York, N. Y., and formerly consultant to Rubber Coordinator Arthur Newhall. Mr. Pittman's associates are Willis A. Gibbons, director of developments, United States Rubber Co., Passaic, N. J.; Irving L. Murray, chief process engineer, Carbide & Carbon Chemicals Corp., Charleston, W. Va.; and Aristid V. Grosse, who was born in Russia and has been engaged in war research work for the Office of Scientific Research and Development at Columbia University, New York.

The committee left last month by plane for Moscow.

Rubber Director Jeffers on December 13 asked the American people to act as 130-million "committees of one" to rid the nation's streets, alleys, and highways of broken glass, nails, and other tire hazards.

CALENDAR

- Jan. 8. Perkin Medal Award to Robert E. Wilson. Chemists Club, New York, N. Y.
- Jan. 8. Rubber & Plastics Division, Montreal Section, S. C. I. McGill University.
- Jan. 11-15. SAE War Production Meeting and Engineering Display. Book-Cadillac Hotel, Detroit, Mich.
- Feb. 12. Chicago Rubber Group.
- Feb. 12. Rubber & Plastics Division, Montreal Section, S. C. I. McGill University.
- Feb. 18. Buffalo Group and Western New York Section, A. C. S. Niagara Falls, N. Y.
- Mar. 5. S. C. I.—A. C. S. William H. Nichols Medal Award.
- Mar. 12. Rubber & Plastics Division, Montreal Section, S. C. I. Miner Rubber Co., Granby, P. Q., Canada.
- Apr. 9. Rubber & Plastics Division, Montreal Section, S. C. I. McGill University.
- Apr. 30. Buffalo Rubber Group and Canadian Chemical Association. International Meeting. Niagara Falls, Ont., Canada.

¹ INDIA RUBBER WORLD, Oct., 1942, p. 57.

Mechanicals Pricing Revised, Other OPA News

Amendment 3 to MPR 149—Mechanical Rubber Goods—issued December 2 and effective December 8, reduces the number of reports required of manufacturers of mechanical rubber goods under the regulation and makes other changes to clarify and simplify it. Thus, to show more specifically what goods (except where the rubber content is more than 50% balata by weight) are covered by MPR 149, three lists of items have been put into the regulation: Appendix A shows goods priced on the basis of conditions prevailing October 1, 1941:

Belting
Hose and tubing
Jar rings and container sealing compound
Lined or covered tanks, pipes and fittings, and other rubber lined or rubber covered items when lined or covered with either soft rubber or hard rubber, excepting rubber covered rolls
Packing, sheet and strip rubber, and gaskets cut therefrom
Plumbers' supplies and specialties
Tape, except cable wrapping tape and surgical adhesive tape
Thread and yarn, both bare and covered

Appendix B shows goods whose prices are to be computed with January 5, 1942, as the base date:

Airplane parts, of types and kinds not listed in Appendix A, including deicers and fuel-cells
Automotive parts, of types and kinds not listed in Appendix A
Brake linings and clutch facings
Equipment parts, of types and kinds not listed in Appendix A
Flooring, mats and matting
Foamed latex products
Gaskets of types and kinds not listed in Appendix A
Hard rubber goods, except when used as linings or coverings for tanks, pipes, fittings and other lined or covered items
Machinery parts, of types and kinds not listed in Appendix A
Molded, extruded and lathe-cut goods of types and kinds not listed in Appendix A
Oil well specialties
Rubber covered rolls
Sponge rubber goods
All other mechanical rubber goods, except those listed in Appendix A

and Appendix C illustrates the type of goods not covered at all by the regulation:

Bathing apparel
Cement
Covered wire and cable wrapping tape
Dental goods
Drug sundries, including surgical adhesive tape
Footwear
Gloves
Heels and soles
Latex products, other than foamed latex products
Paint
Proofed goods (rubberized fabrics)
Protective clothing
Sporting goods
Stationer's supplies
Tires, tubes and tire repair materials
Toys and novelties

Also, any manufacturer of mechanicals who finds it impossible to figure maximum prices under methods in the regulation may suggest a method he believes adaptable to his products. Once a manufacturer has determined his ceiling for an item, that price will be the maximum for subsequent sales to buyers of the same class, but purchasers of different quantities may be put into different classes if such was the practice of the manufacturer on the base date in computing the price. A manufacturer must keep records of all his regularly quoted prices on the base dates of MPR 149.

"Manufacturer" has been redefined to make sure that middlemen who may make some minor physical alteration in the finished goods are not among those whose

prices are covered by the order. "Regularly quoted price" and "standard list item" have also been defined for clarity.

Amendment 4, MPR 149, issued December 3 and effective the eighth, sets ceilings for all sales of industrial hose made with neoprene instead of natural rubber to take care of the higher costs involved in the use of the synthetic. This move was necessitated by the WPB requirement that beginning December 1, 1942, certain types of hose must be made of the synthetic because of the shortage of natural rubber. As neoprene costs about three times more than crude rubber, manufacturers' ceilings on neoprene hose range from 11 to 55% above prices for natural rubber hose; the spread depends largely upon the amount of synthetic in the product. Hose involved is that used on gasoline pumps, pneumatic drilling and riveting tools, and as parts of a range of other mechanical equipment.

Footwear Orders

Amendment 3, MPR 200, issued November 30 and effective December 5, gave wholesalers of rubber heels until December 31 to pass on to shoe repairmen the amount of any federal excise tax added to the price of rubber heels. The excise tax on rubber products was discontinued November 1, and OPA studies revealed that wholesalers stocked with rubber heels bought at a price including the tax had ample time to resell them by the end of the year. The amendment also provides that the quality of sport heels may be designated by marking the container in which each unit is sold rather than by putting a mold mark directly on the heels because many manufacturers produce several grades of sport heels in the same mold.

Amendment 4, MPR 229—Retail and Wholesale Prices for Victory Line Waterproof Rubber Footwear—issued December 8 and effective December 14, gives further material on applicability and pricing under the order and sets forth the price for men's molded clogs.

Dealers who have been reluctant to dispose of "pre-victory" lines of waterproof rubber footwear in expectation of higher prices have been advised by OPA that no general adjustment of such prices is in prospect.

Order 154 under 1499.3(b) of GMPR, issued November 27 and effective the next day, relates to the maximum price for rubber heels (other than those sold in the shoe repair trade) made by Beebe Bros. Rubber Co., Nashua, N. H.

Amendment 6 to Ration Order 6—Men's Rubber Boots and Rubber Work Shoes Rationing Regulations—effective December 16, simplifies reports required of retailers, wholesalers, and manufacturers and also permits manufacturer to transfer rationed footwear items in limited quantity to wearers for experimental "wear testing" purposes without collecting rationing certificates from the wearer; however title to such footwear must be retained by the manufacturer. Amendment 7, issued December 21 and effective December 26, states that lumbermen who need laced rubber boots (pacs) are eligible for rationing certificates

authorizing purchase of this type of footwear, previously reserved exclusively for miners. The Office of the Rubber Director has agreed to allocate an additional supply of rubber for increased production of this essential footwear.

On Tire Rationing

Several amendments have been released to Ration Order No. 1A—Tires, Tubes, Recapping, and Camelback. No. 2, issued and effective December 1, excused until January 1 commercial vehicle operators required to have obtained a Certificate of War Necessity from the ODT as a first step in qualifying for tires under the OPA rationing regulations, if the operators had applied for the certificate and had received no final word from the ODT as to the status of their application. No. 3, also issued and effective the first of December, sets the effective date of Ration Order No. 1A as December 1, 1942, except for territories and possessions of the United States, for which the date is March 1, 1943. The amendment further provides that although Order 1A supersedes WPB Supplementary Order No. M-15-c as Amended and the Revised Tire Rationing Regulations as Amended, any violations, etc., occurring prior to December 1 shall be governed by the orders, regulations, and amendments in effect when the violation occurred; also the Revised Tire Rationing Regulations as Amended shall remain in force in U. S. possessions and territories until March 1, 1943. No. 4, effective December 9, lightens restrictions on the grades of tires a tire seller may buy for inventory replenishments.

Total stocks of new passenger car tires in trade channels in the United States as of September 30 were just over 9,000,000. This figure, reached by the OPA on the basis of full inventory reports from manufacturers and mass distributors and not-quite-complete returns from dealers, compares with a normal figure of about 30,000,000 new tires sold each year for replacements. Between January 5, 1942, when the tire rationing program began, and September 30, 1942, only 1,438,672 new passenger car tires were released. The OPA also announced that under the Idle Tire Purchase Plan, motorists turned in almost 10,000,000 tires to the government up to the close of business December 5.

Other Price Rulings

Order 147 under 1499.3(b) of GMPR, issued November 24 and effective November 25, covers ceiling prices for "Victory Film," a thermoplastic sheeting, of The Goodyear Tire & Rubber Co., Akron.

Order 148 under 1499.3(b) of GMPR, issued November 24 and effective the next day, approves maximum prices for sales by The Dow Chemical Co., Midland, Mich., of polystyrene solution.

Order 3 under 1499.3(c) of GMPR, issued November 28 and effective November 30, sets forth maximum prices which General Tire & Rubber Co., Akron, O., and other sellers may charge for Saf-T-Blak film; special adhesive cement; Saf-T-Glo emergency signs, markers, guide strips, luminous automobile blackout protectors, and luminous arm bands.

Amendment 45 to Supplementary Regulation 1 to GMPR, issued December 19 and effective December 24, exempts from the main order vinyl acetate-vinyl chloride copolymer transcription records sold, delivered, or transferred by the United States or any agency thereof.

Amendment 61, MPR 136 as Amended—Machines and Parts and Machinery Services—issued December 5, but retroactive to November 7, 1942, extends to all other types of lead-acid storage batteries regardless of use the increased maximum prices for automotive replacement storage batteries. The ceiling also applies to parts.

Personnel Mention

Leon Henderson announced his resignation December 17 as Administrator of the Office of Price Administration because of ill health. His resignation becomes effective upon the appointment of his successor, not yet named.

The OPA, at the request of Rubber Director William M. Jeffers, on December 5 modified its mileage rationing regulations to grant additional gasoline rations to traveling salesmen.

WPB Rulings

Consumers of reclaimed rubber are limited to a 45-day working inventory under the terms of Supplementary Order M-15-b as amended November 30, 1942. The order previously limited inventories of all other types of rubber, but did not apply to reclaim. All rubber, including reclaimed, is under complete allocation control. The new ruling does not apply to inventories in the hands of reclaimers. The inventory limitation on consumers was issued because of increased demand for high-grade reclaimed rubber, plus the fact that a number of consumers have accumulated substantial inventories.

Limitation Order L-90, as Amended December 15, 1942—Corsets, Combinations, and Brassieres—removes restrictions on the production of brassieres and bandeaus because scrap elastic material is generally used in their manufacture. The order had originally limited monthly production of the garments to 75% of the average monthly output in the three-month period ending March 31, 1941. The amended order also encourages the use of scrap elastic in making hose supporters (limited to four to a garment) and garter belts (allowing a maximum of 16 square inches of scrap per garment for girdes and closures in garter belts).

Rubber (crude and Buna S, liquid latex, reclaimed, and synthetic) is on the list of the three controlled materials (steel, copper, and aluminum) and 16 other materials which are to be included in bills of materials and inventory reports under the Controlled Materials Plan.

Existing restrictions on the production and sale of new tire retreading and recapping equipment became applicable also to used equipment by General Limitation Order L-61, as Amended December 17, 1942—Tire Retreading, Recapping, and Repair

Equipment. Other changes in the order, to halt acquisition of this scarce equipment by speculators and to insure proper distribution, were made by: (1) extending applicability of restrictions on manufacture and distribution to all persons, and (2) allowing transfer, sale, or other distribution of new and used retreading equipment by written or telegraphic authorization of the Director General for Operations without preference rating.

General Imports Order M-63 as Amended November 20, 1942, and Supplemental General Imports Order M-63-a as Amended November 26, 1942, deal with the importing of strategic materials and restrictions on their disposition.

Limitation Order L-81 as Amended November 24, 1942, prohibits the use of certain materials, including rubber, for toys and games.

Limitation Order L-114 as Amended November 27, 1942, restricts the use of scarce materials, including rubber and synthetic rubber, in making safety equipment.

Additional control over the purchase of laboratory equipment went into effect with the issuance of Limitation Order L-144, as amended, December 5, 1942, which provides that no purchaser of laboratory equipment shall be permitted to acquire an item valued at more than \$50 or any quantity of the same item to the value of more than \$50, without authorization for such purchase by the Director General for Operations. "Laboratory equipment" means material, instruments, appliances, devices, parts thereof, tools, and operating supplies for laboratories, or for use in connection with operations usually conducted in laboratories, not including second-hand items.

Limitation Order L-158, as Amended December 12, 1942, sets further restrictions on the materials entering into the production of replacement parts for passenger automobiles, light, medium, and heavy motor, trucks, truck trailers, passenger carriers, and off-the-highway motor vehicles.

Limitation Order L-201 as Amended December 5, 1942, further restricts the manufacture of automotive tire chain and chain parts.

General Limitation Order L-227—Fountain Pens, Mechanical Pencils, Wood Cased Pencils, Pen Nibs, and Pen Holders—issued December 7, sharply curtails the number of pencils and fountain pens to be made in 1943. Banned for the duration is the use of crude and reclaimed rubber for erasers on pencils; also rubber parts for fountain pens are prohibited when inventories as of December 7, 1942, are exhausted. The number of fountain pens allowed for this year is 18 million, contrasted with 50 million in 1941.

General Preference Order M-190, issued December 9, places calcium carbide under allocation control, effective January 1. Deliveries are prohibited without specific authorization except for monthly shipments of 10 tons or less and for resale for house or mine lighting. Calcium carbide is essential for cutting and welding for chemical manufacture, notably in the production of rubber. Requirements have exceeded production.

The WPB General Salvage Branch, in

collaboration with the American Dental Association, recently announced a program calling for the conservation of all dental material and equipment and obsolete rubber and metal objects.

Personnel Activities

Donald M. Nelson, WPB chairman, on November 27 approved a proposed agreement entitled "Agreement Amending Substitute Agreement Regarding Exchange and Use of Technical Information and Patent Rights under Oil Industry Processes for Production of Butadiene", dated October 12, 1942, between Rubber Reserve Co. and Universal Oil Products Co., Standard Oil Development Co., Shell Development Co., and Phillips Petroleum Co. and to be ratified by Jasco, Inc., The M. W. Kellogg Co., and The Lummus Co.

Mr. Nelson in Certificate No. 25—Exchange of Technical Information Concerning Synthetic Rubber—to the Attorney General on December 4, states he is requesting all manufacturers of synthetic rubber and of rubber-consuming products, to collaborate, under direction and supervision of the Office of Rubber Director, in the exchange of technical information and the furtherance of technical improvements, research, developments, and testing relating to the manufacture and utilization of synthetic rubber and the manufacture of rubber-consuming products, in order to aid the war effort.

Ralph J. Cordiner, president of Schick, Inc., Stamford, Conn., on December 8 was made WPB Director General for War Production Scheduling.

Lawrence C. Leonard, formerly in charge of the PRP unit of the Chemicals Division, has been appointed chief of the Distribution Section of that division.

Leon Henderson on December 10 resigned as director of the Office of Civilian Supply and was succeeded by Joseph L. Weiner, deputy director.

B. C. Heacock, chairman of the executive committee, Caterpillar Tractor Co., has been appointed director of the Priorities Control Division of the Distribution Bureau.

James A. Merrill, United Rubber Workers of America and Goodyear Tire & Rubber Co., Akron, O., was one of ten American production soldiers honored by President Roosevelt on December 10 at the White House for outstanding contributions to the war effort. Mr. Merrill thus was one of the first six workers upon whom were bestowed Citations of Individual Production Merit, the highest honor conferred by the WPB for individual achievement in war work. These men also received from the President both a gold emblem and a document signed by Mr. Roosevelt and Mr. Nelson.

In the fourth group of workers named by the Board for Individual Awards of the WPB for national recognition for suggestions that help war production were Ulysses Edwin Kuntz, of Goodyear, who received a Certificate of Individual Production Merit, and John C. Richardson, also of Goodyear, who got a Letter of Honorable Mention. Joseph Rockoff, chief chemist, Dayton Rubber Mfg. Co., is a member of the Board for Individual Awards.

EASTERN AND SOUTHERN

National Power Show

The Fifteenth National Exposition of Power and Mechanical Engineering was held this year in Madison Square Garden, New York, N. Y., November 30-December 4. The war had much to do with the drop in the number of exhibitors, which totaled 132 as compared with the 1940 peace-time total of 290. Around 16,000 interested persons attended the show, which stressed the duties of manufacturers, engineers, and power plant operators in aiding the winning of the war. Proper maintenance and repair of existing equipment which might not be replaceable for the duration were the main themes in most of the displays, and such new equipment as was offered used substitutes for metals and rubber. Power-operated machines that could be used by the smaller shops doing sub-contract work on government orders were also emphasized throughout a greater part of the exhibition.

Among the exhibits of interest to the rubber industry were those of the Cambridge Instrument Co., Inc., New York, recording and indicating instruments; Edi Trimming Machines, New York, apparatus for trimming and cutting rubber and plastic sheets; Garlock Packing Co., Palmyra, N. Y., packings; and Lord Mfg. Co., Erie, Pa., which had a comprehensive display of flexible couplings and mountings utilizing rubber in shear to absorb vibration.

Thiokol's Freeze Test Adopted

For the past 10 months Sub-Committee V of SAE-A.S.T.M. Technical Committee A on Automotive Rubber has been working on the standardization of synthetic rubber specifications. In so far as possible, methods of tests have followed A.S.T.M. procedures. A.S.T.M. has no recommended procedure for measuring the low temperature flexibility of synthetic rubber. This committee, after careful consideration, has recommended the use of a modification of the freeze test of Thiokol Corp., Trenton, N. J. This method of testing for low temperature flexibility has been incorporated into a number of recent Aeronautical Material Standards Specifications covering synthetic rubber.

The instrument and its operation, as used in the Thiokol Corp.'s laboratory, can best be understood from the accompanying photograph. The principle of the test is based on bending the samples between two parallel plates. By control of the minimum distance between the plates at the time of maximum bend, the sample can be given most any desired radius of bend. By turning the crank the samples are flexed. Whether the crank is turned a half revolution, a whole revolution, or several revolutions, depends on the prescribed conditions set up for the test.

The sample, usually in the form of a strip 4 inches by 0.25 inch by 0.60 inch, is mounted between plates $2\frac{1}{2}$ inches apart to form a loop. The plates should be sufficiently wide (i. e., 2 to $2\frac{1}{2}$ inches) so that



Samples Mounted with Plates Apart
Preparatory to Flexing in Thiokol Apparatus

the bend in the test piece doesn't protrude beyond the edge when the plates are brought together.

When the samples have been properly conditioned at the low temperature, the samples are flexed by simply turning the crank.

The apparatus is very simple and exceedingly flexible. It allows numerous adjustments as to the amount of bend given the sample and also the number of bends.

Film Explains Latest Advances in Die Casting

A most interesting and timely sound-film on "Die Casting", sponsored by the New Jersey Zinc Co., 160 Front St., New York, N. Y., had its preview on December 18 and greatly impressed those privileged to witness it. The film, of a strictly educational nature and entirely devoid of commercialism, is the result of long study of the needs of the engineering student and was tailored to fit those needs as outlined by prominent educational authorities. In all, three reels were made to cover the subject; these later were condensed into one, which embodies the outstanding points.

Although specialists in zinc, the sponsors included a wide range of other alloy products in the plan to cover the field thoroughly. The picture explains the efficiency, speed, and economy in manufacturing complete units and parts made possible by die-casting and depicts graphically the entire process in detail and was supplemented by an excellent descriptive talk. An illustrated descriptive book, outlining die casting, is available with the film.

The film "Die Casting" was produced by Paul Hance Productions, Inc., and much of the preparation and development work was done by C. R. Maxon, market development director, of New Jersey Zinc.

War Report of Standard Oil

The Standard Oil Co. of New Jersey, New York, N. Y., in its war program report to the public revealed that since December 7, 1941, the petroleum industry has greatly increased production of products formerly manufactured in relatively small quantities only as petroleum by-products. Also pointed out was the fact that in the last year the oil industry has been so revolutionized that it now turns out in volume butadiene for synthetic rubber and toluol for TNT. Progress in synthetic rubber and an ever-mounting production of 100 octane aviation gasoline were listed as outstanding accomplishments.

Stating that the rubber shortage was anticipated long ago, Standard Oil claims to have been making approximately five tons of rubber daily out of oil when Japan struck. Its synthetic rubber capacity has been doubled since then, and today the company's first Butyl rubber plant is in preliminary operation making chemical rubber. Also butadiene is being made for the manufacture of Buna S. The company also has 200 newly assigned technologists who will seek newer and improved rubber-making methods.

At first a tire made of Butyl lasted about 200 miles. Methods of compounding and manufacturing have been so improved since 1939 that today a Butyl tire will last more than 20,000 miles at speeds less than 40 miles per hour. An inner tube of Butyl surpasses one of natural rubber, Standard Oil states.

The report also disclosed the operation of two fluid catalytic cracking plants, where petroleum is cracked, and its components are separated. Thus in each plant nine operators, in a very short time, secure propane, propylene, normal butylene, iso-butylene, normal butane and iso-butane, both aviation and motor gasoline constituents, synthetic rubber raw materials, blending agents for aviation gasoline, and many other products. Toluene, the base for TNT, is also being produced in tremendous quantities from petroleum by means of a process developed in peace-times.

The company assured the American people that mineral oil substitutes originated in petroleum research laboratories would replace scarcer-growing animal and vegetable oils. In conclusion it stated:

"As the war progresses and moves forward with a mounting tempo we are ready to meet new demands, to achieve new production records, to develop new and improved products and in every sense of the word to go all out for the nation's total war effort."

American Standards Association, 29 W. 39th St., New York, N. Y., has, according to Secretary P. G. Agnew, launched a program of Inter-American cooperation on industrial and engineering standards.

Important Tire Conservation Method Revealed

A simple, common-sense method for getting more out of the thousands of pounds of the rubber in the nation's tires by the prevention of costly roadside flats was explained to representatives of various rubber and automotive trade journals by A. Schrader's Son Division of the Scovill Mfg. Co., Brooklyn, N. Y., last month. By preventing the damage that usually results when a tire goes flat on the road, it was reported that the average mileage obtained from a given tire might be almost doubled, with the resultant saving in our rubber stockpile.

This tire conservation method is an outgrowth of field surveys conducted for the last three or four years by this company to determine the degree of over- and under-inflation existing in the tires of commercial and passenger vehicles. It has been found that by checking the pressure in the tires of hundreds of cars as they drive into service stations that from 20 to 50% have one or more tires definitely under-inflated. Furthermore, and this is the most important point and the basis of the suggested tire conservation method, if the tire or tires showing the lowest pressure as compared with the others is removed from the car and the tube taken out and examined, in 90% of the cases will be found a nail or some other foreign object in the tire and tube, which is the potential source of the rubber-destroying roadside flat. By means of this simple check by the service station attendant on the comparative pressure in the tires on any vehicle, it will be possible to tell whether or not any of the tires is a potential flat, and which tire it will be. By making the necessary repair then and there, the flat is prevented, mileage of the tire is increased, and rubber saved. In only a very small number of cases was the loss of pressure due to failure of the tire valve. It was also pointed out that even with leaky tire valves, by use of a self-sealing valve cap pressure loss from this source could be eliminated.

Another angle to this method, and one which in most cases will be received as a new fact, is that roadside flats due to punctures most generally do not occur because a tire runs over a nail or some other object and then immediately goes flat. Tires accumulate in their road contacting surface one or more objects which, when the rubber around this puncturing object loses its strength, permit the more or less rapid loss of air pressure and the failure of the tire. Several nails were driven into a fully inflated tire; it was mounted on a car, driven for 30 minutes or more and then parked for over an hour. It was then driven for another 30 minutes; the tire was removed, and the air pressure taken. Pressure was almost equal under comparable conditions of temperature to that before the nails were driven into the tire. When the nails were removed from the tire, and the tube taken out and examined, the nail holes in the tube were evident. It was reported that tires containing nails when used under controlled conditions, that is, with pressure loss replaced regularly, had run from 4,000 to 8,000 miles before going flat.

Still another advantage which can be obtained from this regular checking of air pressure in tires before inflation to detect potential flats is that it should mean all tires should be running correctly inflated for a larger part of the time than heretofore. Past results have shown that the loss of mileage on a given tire is in direct proportion to the degree of under-inflation. For example, a tire that runs 20% under-inflated will give only 80% of the mileage which a tire will give that runs correctly inflated most of the time.

The Schrader company is urging that this very simple method of checking tires before inflation be included as a part of the OPA tire inspection program since it would seem that the return for the effort expended would be very worth while not only to the individual car owner, but to the nation as a whole.

New Shock-Absorbent Material

A new material which uses 100% cattle hair felt as a base and is used for padding the interior of tanks and other armored vehicles to prevent unnecessary injury to the occupants during the operation of these units has been announced by the United States Rubber Co., 1230 Sixth Ave., New York, N. Y. The manufacture of the special shapes and sizes required for these uses has been worked out in collaboration with representatives of the War Department.

Pieces of the felt of the proper dimensions for the various items are punched out, and pieces of sateen of the same dimensions are also cut. The sateen is adhered to one side of the felt with a reclaimed rubber cement; then the sateen is brush coated with a neoprene cement. This treatment with neoprene makes this surface fire-, water-, oil-, and gasoline-resistant. The use of the sateen reduces materially the amount of neoprene required for the coating and also provides a surface less liable to be torn in cushioning shocks. An interesting part of the development of this material has been the use of a white pigment in the neoprene for surfacing those items which, when attached to the interior of the tanks, will not be visible from the outside. In this way the maximum possible

use of the limited available light inside the tanks is made. In places where the padding is visible from the outside, an olive drab color is used. A final protective coating of a transparent synthetic resin is applied to this outside surface of the padding to prevent discoloration of the white surface. The material is then vulcanized, inspected, and packed for shipment.

The material is usually adhered directly to the metal surfaces in the interior of the tank, but in some special cases where this work is difficult, the pads are attached to a metal holder, which is then spot welded to the inside of the tank. A thickness of $\frac{3}{4}$ inch is standard for the material.

Engineering and Service Departments Gather

U. S. Rubber held a meeting in Detroit last month for field engineering and service department representatives, who voiced the opinion that the average driving public is not whole-hearted in cooperating with the government's gas rationing for rubber conservation program. The first topic brought up was the reaction of the civilian population to gas rationing in various territories in the United States. The second question discussed was the attitude of the average motorist toward the "share the ride" plan and general conservation of tires. Thirdly, the care and abuse of commercial vehicle tires was put before the group. The fourth question related to the performance of the new war tires. All regions reported good results on these tires. But it should be noted that tread wear varies in different sections of the country, depending on the atmospheric temperatures and topography. The efforts of the Armed Forces to conserve rubber was the last topic, and all branches of the service were reported as cooperating to the fullest degree.

Kenneth E. Nighman, formerly a sales engineer at U. S. Rubber, has been made manager of public relations at Detroit.

J. M. Huber, Inc., 460 W. 34th St., New York, N. Y., has under construction a new furnace-type plant to produce the semi-reinforcing type of black. This plant, at Borger, Tex., where the company produces its own natural gas for this unit as well as its six channel black units, is expected to be completed in mid-1943.



New Shock Absorbing Material to Protect Men in Tanks

The New Jersey Zinc Sales Co., 160 Front St., New York, N. Y., recently made D. P. Brannin, formerly in charge of metal sales in the Chicago area, district sales manager of the pigment and metal sales divisions, with headquarters in Chicago; and J. P. Dunphy, of the New York sales department, has been named district sales manager of the pigment division, with headquarters in New York. Mr. Brannin joined the company in 1913 as a buyer of western and Mexican ores for the ore and fuel department in Denver and in 1921 was transferred to Chicago to develop sales of the company's metallic products. Mr. Dunphy has been associated with New Jersey Zinc for almost 25 years. He was chief clerk of the sales department in New York until 1922, when he took over many sales accounts in the New York area, and since 1928 has traveled the New England territory.

Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh, Pa., in a recent report by President Roy A. Hunt stated that last year the United States produced aluminum at a rate greater than all of Nazified Europe and probably is producing eight times as much as Japan. It is expected that this year the country should reach a peak which the entire Axis aluminum production cannot hope to achieve. With Alcoa's \$250,000,000 expansion nearly completed in 1942 and with other privately owned and government financed plants in operation, output in the United States last year was more than a billion pounds of aluminum. When the plants Alcoa is building for the Defense Plant Corp. are ready and the peak of 1943 production is reached, the nation's annual capacity will hit 2,100,000,000 pounds, 63% more than the world's aluminum output in 1938. Aluminum Co. of America is scheduled to produce a major portion of the new total in its own plants and those it will lease from the government.

The ODT on December 1 in a message to farmers, stock raisers, and dairymen stated no farmer will be put out of business as a result of the Certificate of War Necessity plan. As long as the tires, spare parts, and gasoline are available, the ODT will help every farmer get enough tires, spare parts, and gasoline to carry on his necessary truck operations. Any farmer with a Certificate of War Necessity that does not take care of his essential needs is urged to take the matter up with his County Agent, County War Board, or County Farm Transportation Committee.

Amendment 3 to General Order ODT 21, issued November 30 and effective the next day, relates to conditions surrounding the transfer or delivery of motor fuel and commercial vehicle parts, tires, or tubes, and the keeping of records of operations of a commercial motor vehicle for which a Certificate of War Necessity has been issued.

The ODT on December 8 simplified procedures to handle appeals from commercial motor vehicle operators who consider inadequate for their needs the mileage and fuel allotments provided in their Certificates of War Necessity.

Koppers Co., Pittsburgh, Pa., is erecting a large plant somewhere in Pennsylvania to produce butadiene and styrene. Completion is expected by spring, according to Wm. F. O'Connor, director of operator employee training for the Koppers United Co., Butadiene Division. Faced with a shortage of skilled and semi-skilled workers to operate the plant when it is finished, Pauline Harrington, personnel director of women, is recruiting several hundred men and women to attend classes which will fit them for jobs in the synthetic rubber program. Lectures on chemistry and laboratory work are being given by Dr. O'Connor and by University of Pittsburgh professors and instructors. Students who pass with acceptable grades will be guaranteed jobs in the new plant.

Pennsylvania Rubber Co., Jeannette, Pa., effective December 1, named as advertising and sales promotion manager Earl R. Billings, formerly sales and advertising manager of Everett Piano Co.

The Pennsylvania company plans continuing advertising post-war products in 1943, a policy which started April 18, 1942, with an announcement of the Pennsylvania Silent Vacuum Cup Tire.

Association of Consulting Chemists & Chemical Engineers, 50 E. 41st St., New York, N. Y., on December 7 at the Electrical Testing Laboratories, Inc., New York, held a dinner-meeting "Conference on War Service" attended by independent consulting chemists and engineers and representatives of the U. S. A. Chemical Warfare Service and Ordnance Department, U. S. N. Bureau of Ships, Bureau of Supplies and Accounts, and Navy Purchasing Office, and of the War Production Board.

Hermann Weber & Co., dealer in rubber gutta percha, hard rubber, hard rubber dust, and balata, on December 15 moved from 67 Broad St. to Room 1105, 76 Beaver St., New York, N. Y.

Rubber Reserve Co., Washington, D. C., has "drafted" Roy A. Shive, of the Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J., to supervise production and development of chemicals for synthetic rubber. Dr. Shive at one time was employed in the central research laboratories of United States Rubber Co., New York, where he began his inquiries into the utilization of latex. Before joining Calco in March, 1934, Dr. Shive was engaged in developing pigments and synthetic resin paints and enamels for du Pont and as director of manufacture for Arco Co., Cleveland, O. At Calco he supervised research and development of organic dyes and intermediates for use in the organic pigment industry and allied fields.

Jarvis & Jarvis, Inc., Palmer, Mass., according to General Manager E. R. Scudder, is using treads molded from Monsanto's Resinox, a phenol-formaldehyde compound not heretofore considered a possible rubber replacement, to substitute for rubber tires on wheeled restaurant equipment and industrial handtrucks. Although less resilient and noisier than rubber, the plastic treads are said to roll easier over any surface and to be more readily attached to a wheel. In tests to determine wearing qualities of the new treads, steel testing equipment was worn out before the plastic treads began to show signs of wear. Jarvis & Jarvis plans, if necessary, to use the plastic treads on wheeled stretchers and similar hospital equipment. These treads have been developed in cooperation with engineers of the plastics division of Monsanto Chemical Co., which points out, however, that the plastic used for this application is not suitable for automobile tires, but significant quantities of rubber may be saved by its use on casters and wheels of the type produced by Jarvis & Jarvis.

Supreme Court's Decision on Carbon Black Case

On December 7 the United States Supreme Court handed down a unanimous opinion in the case of United Carbon Co., et al. Petitioners, v. Binney & Smith Co., Respondent, invalidating the product claims of Wiegand & Venuto Patent No. 1,889,429, covering a process of making carbon black pellets and the pelleted product. The principal basis for the decision was the indefiniteness of the product claims, though the defenses of anticipation and lack of invention were also touched upon.

The United States Supreme Court decided:

"We are of opinion that the claims in litigation are bad for indefiniteness, and have no occasion to consider questions of novelty, invention and infringement.

"The statutory requirement" (see 4888, Rev. Stats.: 35 U. S. C. sec 33) "of particularity and distinctness in claims is met only when they clearly distinguish what is claimed from what went before in the art

and clearly circumscribe what is foreclosed from future enterprise."

Binney & Smith Co. instituted suit for infringement of the product claims in the United States District Court for the Northern District of West Virginia in 1939. In February, 1941, the District Court held the patent invalid and not infringed. In January, 1942, the Circuit Court of Appeals for the Fourth Circuit reversed, holding the product claims valid and infringed. The Supreme Court, in effect, reinstated the judgment of the District Court.

It is stated that the peculiar process of Wiegand & Venuto involving the use of two liquids and abandoned in 1932 was not involved in the case. Since that date practically all carbon black manufacturers have devised processes of their own involving either one liquid or none, by means of which practically 90% of all carbon black is now treated.

OHIO

New Technique of Processing Synthetic Rubber

Fear that need of special new machinery for mixing synthetic rubber might become a serious bottleneck in large-scale production of tires was dispelled December 7 by John W. Thomas, chairman of The Firestone Tire & Rubber Co., Akron, who announced that company engineers and chemists had developed a technique for processing Firestone's Butaprene synthetic rubber so that present available mixing machinery is entirely adequate to take care of conversion from natural rubber to synthetic. In line with the company's all-out-for-victory policy the new technique is being passed along to the entire industry with the belief that it will be equally effective in solving the problem of mixing other types of synthetic rubber for tires.

Prior to this announcement the rubber mixing machinery problem had caused considerable anxiety throughout the rubber industry. It was expected that additional new, complicated machinery, which would require quantities of critical materials, would be extremely difficult to obtain without effecting the already overburdened heavy machinery manufacturers. Obviously the time required to manufacture and install the equipment would have delayed tire production schedules.

Report on Company Activities

Mr. Thomas in the recent annual statement to stockholders said Firestone plants had been running at capacity making war goods. A new plant to manufacture airplane wings went into production in October, and the company bought a factory in Indiana and leased one in Texas to produce bullet-sealing airplane tanks.

Rubber production on the Firestone plantation in Liberia has been increased, and the Firestone organization "is cooperating with the government in the development of rubber sources in the Western Hemisphere."

Goodrich Activities

To describe more accurately the functions of the organization, which are to stimulate new uses and outlets for its rapidly expanding production of plastic materials, The B. F. Goodrich Co., Akron, has created a plastic materials division, superseding the synthetics sales department. Key personnel remains the same, with J. R. Hoover division manager. S. L. Brous directs technical service and distribution of raw plastic materials, assisted by George Fowles, electrical engineer assigned to the wire and cable industry, and O. E. Isenburg. Semi-finished products, as coated fabrics, are handled by John Haughton and Clyde Segner. Harold Mosher is assigned to special study on new products; while R. W. Stuart is division operations manager. Sales of finished plastics products made by the company for the industrial, sundries, stationers, and surgical

trades will be directed by L. H. Chenoweth, manager, manufacturers sales, industrial products division.

Another large-scale government-financed synthetic rubber plant has started operations, according to John L. Collyer, Goodrich president. This plant, in Kentucky, will ultimately utilize butadiene made from alcohol and will shortly be in full-scale production of general-purpose synthetic rubber for use by the armed forces of the United Nations. The plant is an important unit in the government's synthetic rubber program, which on completion calls for the production of more than 875,000 tons of synthetic rubber a year.

M. G. Huntington, with Goodrich in various sales capacities since 1923, has been made manager of the Washington office of the national sales and service division of the company, succeeding K. D. Smith, who has assumed new company duties with headquarters in Detroit, Mich.

Cornelius B. Burmood, for four years chief pilot for Generalissimo Chiang Kai-shek in China and more recently with the United States Ferry Command, was made manager of flying operations for Goodrich on December 1, with headquarters in Akron.

Three more Goodrich technical men have been loaned to the United States Government and have assumed posts in organizations administering the nation's synthetic rubber program. W. R. Hucks, manager of Goodrich's raw materials division, has been assigned to the operating division of the Rubber Reserve Co.; while R. G. Boyd, manager of planning and scheduling in the Goodrich tire division, has been assigned to the WPB allocation division. R. J. Hull, who will serve on the staff of Rubber Director Wm. Jeffers, was assistant manager of compounding in Goodrich's tire division.

E. A. Seeley, manager of field personnel and training for Goodrich, which he joined in 1926, has been loaned to the Army Ordnance Department's Tank and Automotive Center, Detroit, Mich., as executive personnel advisor.

Goodyear Tire & Rubber Co.

The Earl of Rothes, rubber controller of England, on a tour of the United States, recently visited, among others, the Goodyear plant at Akron.

J. F. Bennett, from June, 1929, until this summer treasurer of Goodyear-Australia, is now assistant treasurer of Goodyear Aircraft Corp.

J. K. Hough, director of advertising at Goodyear, was one of the speakers at the recent international wartime conference of the Association of Canadian Advertisers in Toronto, Ont., Canada.

General Tire & Rubber Co., Akron, last month bought the 21-station Yankee Network in New England. Wm. O'Neil, General president, stated the purchase was the first step in the company's post-war expansion plans. Through the network the firm will broadcast advances made in synthetic rubber and continue the news and entertainment features.

The Dayton Rubber Mfg. Co., Dayton, has announced that C. D. Bucher is new director of purchases, succeeding J. C. Cunningham, who resigned. Mr. Bucher was formerly with two Akron rubber companies in a similar capacity and has been in the purchasing field for 15 years.

MIDWEST

Substitute for Sponge Rubber

The recent announcement of a substitute sponge rubber by the Bauer & Black Division of the Kendall Co., Chicago, Ill., which was developed by the Research Laboratories of Bauer & Black with cooperation from the Northern Regional Laboratory, United States Department of Agriculture, Peoria, Ill., is rapidly taking on production possibilities. At the suggestion of the Rubber Reserve Co., to which the product and process were turned over for the duration to aid the war effort, a meeting was held on December 17 in the Chicago offices of Bauer & Black to discuss and formulate production plans and further development work which will make this new product available for essential war equipment. Production and technical men from Goodyear, Goodrich, Firestone, United States Rubber, Dryden, Faultless, Davidson, Virginia Rubatex, Sun, and Salisbury rubber companies were present at this meeting. These companies and others who may be selected later will have the opportunity of putting into production, as quickly as possible, under the direction of the War Production Board, Office of Rubber Director, this new synthetic sponge rubber product.

This new sponge rubber substitute is made of linoleic acid and can be made in any thickness and in varying densities. It has a remarkable property of vulcanizing directly to many surfaces such as metals and plastics, and it has flex-cracking resistance which improves at lower temperatures, it is stated.

It is believed that the process does not require anything new in the way of equipment and plant facilities, and the materials involved are at present available. It is expected that this new development will find many uses not only in war industries, but likewise in civilian products for which crude rubber is no longer available.

Robert E. Clayton, superintendent of the Servus Rubber Co., Rock Island, Ill., on December 7 discussed synthetic rubber before a meeting of the Rock Island Kiwanis Club.

Wheelco Instruments Co., Chicago, Ill., has appointed Roger W. Allen Southeastern district manager with headquarters in Atlanta, Ga. Mr. Allen for the past six years had been Atlanta district sales engineer for Foxboro Co., Foxboro, Mass.

Reichhold Chemicals, Inc., 601 Woodward Heights Blvd., Detroit, Mich., recently added to its staff Clinton A. Braidwood and C. A. Murray. Mr. Braidwood, who will mainly be working on synthetic rubber formerly was with the United States Rubber Co., New York, N. Y., as a rubber technologist. Dr. Murray has taken over supervision of the refining of soybean and linseed oils at Reichhold. He has worked for E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., at the Jackson Laboratory and for Central Soya Co., Inc., Decatur, Ind., in charge of the refined oils division.

Distillers Corp.-Seagrams, Ltd., Montreal, P. Q., recently held an annual stockholders' meeting at which President Samuel Bronfman stated that research workers of the company have done important work in connection with the production of synthetic rubber, and a process has been developed in the laboratory and pilot plants. The results of these studies together with blueprints for full-sized plants are now in the government's hands.

W. H. Miner, president, Miner Rubber Co., Ltd., Granby, P. Q., on December 16 celebrated his sixty-third birthday.

F. A. Grant, St. John, N. B., manager of the Maritime Provinces branch of the Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., was recently installed as president of the Maritime Commercial Travellers' Association at its sixty-first annual meeting in Halifax, N. S.

R. S. Jane, of Shawinigan Chemicals, Ltd., Montreal, P. Q., discussed synthetic rubber before the Electrical Club of Montreal on December 16.

B. F. Goodrich Co. of Canada, Ltd., Kitchener, Ont., recently held a meeting of company representatives for an intensive course in truck tire conservation as part of a field service program. This was presented by Sales Manager I. R. Needles. Presiding at the meeting was Advertising Manager J. G. Hagey, who discussed the coming consumer and trade advertising campaigns based on the field service program. President George W. Sawin, speaking off the record, gave some facts about the synthetic rubber situation. The Goodrich sound-movie, "Keep 'Em Rolling", on rubber in the war effort, also was shown.

Charles S. Band, vice president, Gutta Percha & Rubber, Ltd., Toronto, Ont., has been elected vice president of Godrich Elevators & Transit Co., Ltd., London, Ont.

Dominion Rubber Co., Ltd., Montreal, P. Q., at its tire factory in Kitchener, Ont., recently turned out the first set of the new tire "sandals" in use in Canada, made from non-strategic materials.

Thirty-three employees from head office manufacturing and sales divisions in Montreal and other parts of Quebec Province received 25-year service pins at a banquet tendered by the company in the Mount Royal Hotel on December 5. P. C. Jones, president, praised the loyalty and cooperation of the workers. Other speakers were W. A. Eden, vice chairman of the board, G. W. Charles, vice president, J. M. S. Carroll, J. W. Jones, R. J. McLeod, and George Latulipe. J. W. Jones, manager, industrial relations department, presided.

Paul S. Smith, head of Dominion Rubber's legal department, at a special meeting of the executive committee of the Montreal branch, Canadian Manufacturers' Association, was chosen to represent the Association on the Montreal City Council of 1942-43.

¹ See INDIA RUBBER WORLD, Nov., 1942, p. 179.

William B. Wiegand, director of research, Columbian Carbon Co., New York, N. Y., U. S. A., has been named to the Synthetic Rubber Technical Advisory Committee of the Department of Munitions and Supply, Ottawa, Ont., replacing R. V. Yohe, Akron, O.

OBITUARY

Frederic Clark Hood

FREDERIC CLARK HOOD, who with his father founded the Hood Rubber Co., Watertown, Mass., in 1896, died at his home in Boston, Mass., on Christmas Eve. Mr. Hood was born in Chelsea, Mass., March 11, 1865. After graduating from Harvard University (Class of 1886), he joined the Boston Rubber Co., which his father had started in 1878. The deceased resigned as secretary to become treasurer and general manager of the Hood company in 1896. In 1916 he was made vice president and in 1923 president. In 1929, Hood Rubber was merged with The B. F. Goodrich Co., Akron, O.

Mr. Hood was an active participant in the Associated Industries of Massachusetts, serving on the executive committee and as president, and held similar positions with the Rubber Association of America, Inc. He was also a director of Rubber Institute, Inc., and of the Association for the Promotion and Protection of Savings, Inc., a member of the Boston Chamber of Commerce and of the Rubber Association of America; and in World War I was treasurer of the Home Service for American Soldiers Abroad and a member of the National War Labor Board.

Surviving him are his wife, his son, and three grandchildren.

William Stamps Farish

FOLLOWING a heart attack, William Stamps Farish, president and chief executive of Standard Oil Co. of New Jersey, New York, N. Y., died in Millbrook, N. Y., November 29. Born in Mayersville, Miss., on February 23, 1881, Mr. Farish taught school to raise funds for a college education and received his law degree from the University of Mississippi in 1900. He had an important hand in the formation of numerous organizations, among which are the Humble Oil & Refining Co. of Texas, American Petroleum Institute (of which he became president), National Petroleum War Service Committee (World War I), and the Brown-Farish Oil Co. of Texas. The Gulf Coast Producers Association unanimously chose him as president in 1915. Later he became president of the Texas-Louisiana Oil & Gas Association and then joined up with Standard Oil in 1917. During the present war, Mr. Farish was an active member of the Petroleum Industry War Council.

Funeral services were held November 30, at St. James Episcopal Church, New York,

CANADA

Rubber Industry Data

Dominion Bureau of Statistics, Ottawa, Ont., in its December 12 report on the growth of the rubber industry in Canada revealed the Dominion is among the leading nations manufacturing rubber goods. In peacetime Canada ranked sixth as an importer of raw rubber, following the United States, the United Kingdom, Japan, Germany, and France.

In 1941 the Dominion had 56 establishments (against 52 in 1940) manufacturing rubber goods; 34 in Ontario, 17 in Quebec, two each in Manitoba and British Columbia, and one in Saskatchewan. Capital investment totaled \$71,985,540, and the plants employed 17,191 workers, who received \$22,792,376 in salaries and wages, \$5,957,462 more than in 1940. Goods produced were valued at \$119,137,776 from materials costing \$59,340,321. The respective figures the year before were \$83,020,721 and \$38,228,145. The Province of Ontario accounted for more than 80% of the 1941 capital, more than 71% of the employees, and almost 82% of production.

The Bureau also reported that heavy demands created by the war greatly expanded the productive capacity of the oiled and waterproofed clothing industry during 1941, when the gross value of its products totaled \$4,500,958, 11% above 1940 output.

Sales of electric storage batteries and parts by Canadian manufacturers during the third quarter of 1942 were valued at \$1,664,348, against \$1,380,480 for the previous quarter and \$1,755,996 for the corresponding period of 1941.

British Rubber Co. of Canada, Ltd., Montreal, P. Q., has elected the four following new directors: W. F. Mackalier, M. W. Gallop, Leslie N. Buzzell, and A. Stuart McLean. Mr. McLean is in charge of manufacturing operations of the company; while Mr. Gallop is secretary-treasurer.

Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., was among the 26 winners in the 1942 Canadian Direct Mail Leaders contest, sponsored by Provincial Paper, Ltd., Toronto, Ont.

and in Houston, Tex., on December 2, with interment in Glenwood Cemetery.

Mr. Farish leaves a wife, a daughter, and a son.

Harrison E. Howe

ON DECEMBER 10, Harrison Estell Howe, editor of *Industrial and Engineering Chemistry* (A. C. S.), succumbed to a lingering heart ailment in Washington, D. C. Born in Georgetown, Ky., on December 15, 1881, Dr. Howe was graduated from Earlham College in 1901 (B.S.) and then went on to advanced study at the University of Michigan. He also held degrees from the University of Rochester (1913 and 1917), Southern College (1934), Rose Polytechnic Institute (1936), and the South Dakota State School of Mines (1939).

In 1902, Dr. Howe was a chemist for the Sanilac Sugar Refining Co., Crosswile, Mich. Two years later, he switched to Bausch & Lomb Optical Co., Rochester, N. Y., as chemist, office manager, and editor. A position as chemical engineer with Arthur D. Little, Inc., Boston, Mass., attracted him in 1916. After a year, Dr. Howe was made assistant to the president of Arthur D. Little, Ltd., in Montreal, P. Q., Canada. From 1917-19 he was manager of the commercial department in Cambridge, Mass.

In the first World War, the deceased was a consultant in the Nitrate Division of the Army Ordnance Bureau. In 1922 he was chairman of the committee on work periods of the American Engineering Council of the Federated Engineering Societies. In 1941 he was appointed chairman of the Chemicals Group and of the Chemicals Priorities Committee (OPM); later he became chairman of the advisory committee of the WPB Chemical Section. Dr. Howe was also a reserve colonel in the Chemical Warfare Service of the Army.

Among the books written by the late chemical expert are "The New Stone Age", "Profitable Science in Industry", and "Chemistry in the World's Work." With E. M. Patch, he wrote a series of six nature and science readers, and with F. M. Turner he was author of "Chemistry in the Home." "Chemistry and Industry" was edited by him in two volumes, and many of his articles appeared in current scientific journals. On November 6 the deceased was awarded the annual medal of the Society of Chemical Industry for his achievements.

Dr. Howe leaves a wife, two daughters, and five grandchildren.

Winfield Scott

FUNERAL services were held November 21 for Winfield Scott, 54, chemist for Goodyear Tire & Rubber Co., Akron, O., who died November 19 at City Hospital in Akron.

Mr. Scott joined Goodyear in 1918 after having served in the Chemical Warfare Division in World War I. Later he left to work for E. I. du Pont de Nemours &

Co., Inc., Wilmington, Del., but returned to Goodyear in 1933, where he remained until the time of his illness.

A former president of the Akron Section, A. C. S., Dr. Scott held patents for more than 100 items and had written numerous articles for chemical journals. He was a member of the American Institute of Chemical Engineers, the Franklin Club, and Sigma Xi.

He is survived by his wife, two daughters, his mother, a brother, and also a sister.

Benno T. Schall

ON DECEMBER 6, Benno T. Schall, for the past 14 years secretary-treasurer of the Corduroy Rubber Co., Grand Rapids, Mich., passed away in his sleep from a heart attack. Before coming to Corduroy in 1924 in an executive capacity, Mr. Schall had been an executive with the Wyeth Hardware & Mfg. Co., St. Joseph, Mo. He was a native of St. Joseph, where he had been born 61 years ago.

The deceased was a member of the National Credit Men's Association, the Elks and the Peninsular Club.

He was buried in St. Joseph. Among his survivors are his sister and several nieces and nephews.

Carbon Black Production

(Continued from page 380)

for January through September 1941, were reported as only 800 pounds, value \$101; while acetylene black imports (all from Canada) for the same period were 2,907,751 pounds, value \$310,084.

Market conditions for 1941 were favorable, showing a 30% decrease in producers' stocks between January 1 and December 31. Stocks on hand the year-end were 118,847,000 pounds, the lowest since the 100,497,000 pounds of 1937. The average value of carbon black at the plants rose from 2.90¢ a pound in 1940 to 3.26¢ in 1941.

Dividends Declared

COMPANY	STOCK	RATE	PAYABLE	STOCK OF RECORD
American Hard Rubber Co.	Com.	\$0.25	Dec. 21	Dec. 11
American Hard Rubber Co.	7% Pfd.	1.75 q.	Dec. 21	Dec. 11
American Hard Rubber Co.	Com.	1.00 yr. end	Dec. 21	Dec. 11
Crown Cork & Seal Co.	Com.	0.25 resumed	Dec. 28	Dec. 16
Crown Cork International Corp.	Class A	0.10	Dec. 30	Dec. 18
Dunlop Tire & Rubber Goods Co., Ltd.	5% Cum. First Pfd.	2 1/2%	Dec. 31	
Dunlop Tire & Rubber Goods Co., Ltd.	Com.	0.50	Dec. 21	
Firestone Tire & Rubber Co.	Com.	0.50 yr. end	Dec. 28	Dec. 18
Firestone Tire & Rubber Co.	Com.	0.37 1/2 inc.	Jan. 29	Jan. 9
Garlock Packing Co.	Com.	0.75	Dec. 28	Dec. 19
General Tire & Rubber Co.	Pfd.	1.50 q.	Dec. 31	Dec. 21
Goodyear Tire & Rubber Co.	Com.	0.63 q.	Dec. 31	Dec. 15
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	0.63	Dec. 31	
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	2.50 extra	Dec. 31	
Goodyear Tire & Rubber Co. of Canada, Ltd.	5% Cum. Pfd.	0.63 1/2	Dec. 31	
Goodyear Tire & Rubber Co. of Canada, Ltd.	5% Pfd.	0.62 1/2 q.	Jan. 2	Dec. 15
Intercontinental Rubber Co.	Com.	1.00 irreg.	Dec. 24	Dec. 21
Jenkins Bros.	Com.	0.50 yr. end	Dec. 29	Dec. 18
Jenkins Bros.	Founder's Shares	2.00 yr. end	Dec. 29	Dec. 18
Jenkins Bros.	Pfd.	1.75 q.	Dec. 29	Dec. 18
Lee Rubber & Tire Corp.	Com.	0.75	Feb. 1	Jan. 15
Norwalk Tire & Rubber Co.	Pfd.	2.62 1/2 accum.	Jan. 15	Dec. 31
Norwalk Tire & Rubber Co.	Com.	0.20 resumed	Feb. 1	Jan. 15
Seiberling Rubber Co.	Com.	0.50	Jan. 1	Dec. 10
Seiberling Rubber Co.	\$2.50 p. Pfd.	0.62	Jan. 1	Dec. 10
Seiberling Rubber Co.	Class A Pfd.	1.25	Jan. 1	Dec. 10
Seiberling Rubber Co.	Class B Pfd.	0.84	Jan. 1	Dec. 10
U. S. Rubber Reclaiming Co.	Pfd.	0.50 accum.	Dec. 21	Dec. 14

Cramer before Canadian Groups

THE joint meeting of the Rubber & Plastics Division of the Society of Chemical Industry, Montreal Section, and the Society of Chemical Industry, held December 16 at the Ritz Carlton Hotel, Montreal, P. Q., Canada, attracted a record attendance which heard H. I. Cramer, of Sharples Chemicals, Inc., Philadelphia, Pa., discuss synthetic rubber. Dr. Cramer gave a clear and complete picture of the present situation with regard to natural and reclaimed rubber, synthetic elastomers, and the "weed" rubbers. He talked on the present stockpiles of each and what could be expected in subsequent years both as to quantity and cost. The chemical derivation of each rubber and much additional data were clearly illustrated by numerous slides.

Others who spoke briefly at the session were Mr. Faust, president of the Canadian Chemical Association, and Dr. MacFarlane, chairman of the Montreal Section.

The next meeting of the Rubber & Plastics Division, a "Local Talent Night," is scheduled for the Faculty Club, McGill University, January 8. An illustrated symposium has been arranged to acquaint rubber chemists with the plastics industry and plastic molders with rubber technology.

Treated Cotton Belting

COTTONLEATHER is a new material produced by impregnating multi-ply fabric with chemicals to provide density and durability and surface treated and ground to give flexibility and a tan leathery surface on one or both sides. It is available at present in sizes from 1 by 3/42-inch to 6 by 3/16-inch and in shapes including planks, strips, and rolls. Uses to date of CottonLeather include replacing rubber in aisle treads of buses, as shoe soles, as a substitute for leather on loom binders, and as a friction material on loom let-off motions. Suggested uses are for motor mountings, shock absorbing blocks, heavy shim stock, and as anti-squeak webbing. Southern Friction Materials Co.

Progress Report No. 1 of Rubber Director

LETTER OF TRANSMITTAL

November 30, 1942.

Mr. Donald M. Nelson,

Chairman, War Production Board

I submit herewith Progress Report #1 covering the work of the Office of the Rubber Director and the principal problems and situations confronting the Office as of this date.

Because of the need to make clear to the rubber industry and to the public the present status of the rubber program, I ask your permission to print and distribute this report.

WILLIAM M. JEFFERS
Rubber Director

War Production Board, Office of the Rubber Director, Progress Report No. 1

In stating the problem, the "Report of the Rubber Survey Committee" dated September 10, 1942, said:

"Of all critical and strategic materials, rubber is the one which presents the greatest threat to the safety of our nation and the success of the Allied cause. Production of steel, copper, aluminum, alloys or aviation gasoline may be inadequate to prosecute the war as rapidly and effectively as we could wish, but at the worst we are still assured of sufficient supplies of these items to operate our armed forces on a very powerful scale. But if we fail to secure quickly a large new rubber supply, our war effort and our domestic economy both will collapse. Thus the rubber situation gives rise to our most critical problem."

It then established the rubber program and, interspersed with clearly stated reasons, made many definite recommendations.

In accordance with presidential executive order of September 17, 1942,¹ the Chairman of the War Production Board appointed me Rubber Director, delegated to me the powers enumerated therein, and delivered to me a copy of a letter from the President. From this I quote the following two sentences: "I want to carry out the recommendations in the Baruch Report as fully as possible. * * * One of the main jobs is to start the mileage rationing program as quickly as possible."

In harmony with the spirit of the Baruch Report, I have staffed my organization with men who are by training and experience preeminently qualified to direct and execute the work of the major subdivisions of the problems entrusted to me. My first order to them was, in the absence of special and approved contrary reasons, to carry out the recommendations stated or implied in the Baruch Report. Because of this, most of the remainder of this Report takes up the work of the various subdivisions of my organization by describing the present status of those recommendations which it is their respective duties to effectuate. The subdivisions so treated are:

(1) Executive functions incident to policies, programming and reports; and the direction of work carried out under directives from me by the Rubber Reserve

Co., Defense Plant Corp., the Board of Economic Warfare, Office of the Petroleum Coordinator, Office of Defense Transportation, Office of Price Administration, the Department of Agriculture and others.

(2) Supervision of problems incident to plant construction and priorities therefor.

(3) Operations pertaining to the rubber industry, statistics, allocations, requirements and schedules, priorities, reclaiming of scrap, recapping and retreading of tires, etc.

(4) The technology and specifications for industry uses of various natural rubbers, synthetic rubbers, rubber substitutes and reclaims.

(5) Research on and development of synthetic rubbers, new ideas and inventions. This Section is charged with the duty of arranging for and coordinating research on mechanisms of polymerization, as well as the development and engineering of processes, and the piloting of new developments.

(6) Research on and development of processes for the manufacture of raw materials other than those made by processes whose development has been entrusted to other Governmental agencies.

Of the above, the first is directed by me and my deputy, and the remainder by Assistant Deputy Rubber Directors.

Program

The program of this Office cannot be stated better than in the Baruch Report where it said:

"We must supply not only the needs of our armed forces, but most of those of the military machines of our Allies as well. We must equip our buses and trucks and other commercial vehicles and provide on a large scale specialty items for such purposes as factory belting, surgical, hospital and health supplies. And in addition to all these, we must maintain the tires on at least a substantial portion of our 27,000,000 civilian passenger automobiles."

To meet this program necessitates a statement as to our requirements, estimates of our inventory situation, and information as to our ability to bring into production enough Buna S and other synthetic rubbers during 1943 to see us through that critical year.

The Baruch Report estimated that requirements of natural and/or synthetic rubber for 1943-1944 would be approximately as follows:

Total requirements of natural and/or synthetic rubbers (in terms of natural) are estimated as follows:

[In Thousands of Long Tons]		
	1943	1944
Military	325	325
Private transportation	3	3
Commercial vehicles	59	85
Other civilian uses	49	50
Foreign countries	117	103
British deficiency	24	106
Total	577	672

The Baruch Report also definitely established that we cannot be permitted to reduce our domestic inventory of rubber stocks below 120,000 tons at any time. In determining a figure of 120,000 tons as an irreducible minimum, the Baruch Report stated that 50,000 tons thereof would represent a 30-day inventory for American

manufacturers; 4,000 tons would be inventory for Canadian manufacturers, and at least 66,000 tons should be considered as necessary inventory on hand in Great Britain to protect against interruption of Atlantic transportation. They went on to state that at least 100,000 tons of this reserve should be kept in the form of crude to protect those requirements of the military which can only be met by the use of crude. This office believes that their findings were if anything too low and that it would be hard to operate 1,200 American rubber plants with a 30-day over-all inventory at a time when they are converting from the use of crude to the use of Buna S, neoprene, "Thiokol", Butyl, plus several grades of reclaim and several substitutes. This is especially true at a time when transportation facilities are already overcrowded.

Present indications are that our domestic accumulated inventory of crude and synthetic rubber (expressed in terms of crude) at the end of this year, 1942, may approximate 400,000 long tons. If it were not for other programs over which we have no control it seems probable that the accumulated production of synthetic and imports of crude rubber (expressed in terms of crude rubber) might be as much as 175,000 tons by September 30, 1943, and 390,000 tons by the end of 1943. The controlling conditions for these production estimates for 1943 are:

(a) Our ability to secure adequate priorities and proper allocations of fabricated components;

(b) Our ability to complete synthetic plant facilities on schedule; and

(c) The rate at which they come up to full production.

The foregoing is shown graphically in more detail on the accompanying chart. From it, it is obvious that even if these production objectives (175,000 tons and 390,000 tons respectively) are attained, the inventory of crude and synthetic rubber in the Fall of 1943 will, to all practical purposes, be down to the absolute dangerous inventory dead-line of 120,000 tons, and by the end of 1943 will have been built up to only 175,000 tons.

(See Chart Herewith)

Explanatory Notes

Requirements

Essential requirements from Table II, page 28, Baruch Report, adjusted to latest quarterly requirement pattern. Therefore, do not include Buna N or reclaim here or in supply.

Supply

1. Imports reflect possible difficulties in exploitation of new areas, lack of equivalency to plantation crude, possible sinkings and/or disorganized transportation as well as shrinkage of wild rubber in washing and drying. They are estimated at 3,000 long tons per month.

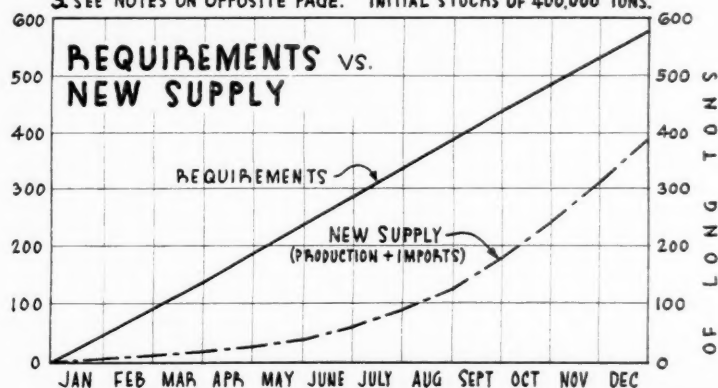
2. Synthetic Production estimated for Butyl, neoprene, and "Thiokol" and Buna S after deducting for butadiene a 60-ton plant inventory and for styrene a 30-ton plant inventory, plus transportation and in process allowances for both of these products of two weeks up to September 1 and one week thereafter. Production estimates based upon no production for first and second units at same location until second month following earliest possible plant

¹ INDIA RUBBER WORLD, Oct., 1942, pp. 57-58.

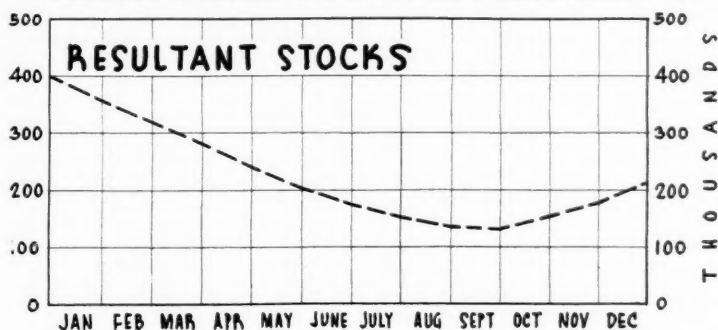
1943 U.S. SUPPLY OF RUBBER vs. ESSENTIAL REQUIREMENTS

IN THOUSANDS OF LONG TONS OF CRUDE AND/OR SYNTHETIC
— IN TERMS OF EQUIVALENT CRUDE

NOTES—1. RECLAIMED RUBBER AND BUNA N NOT INCLUDED. 2. ALL DATA ARE ON A CUMULATIVE BASIS. 3. SEE NOTES ON OPPOSITE PAGE. 4. RESULTANT STOCKS OBTAINED BY SUBTRACTING DIFFERENCE BETWEEN REQUIREMENTS AND SUPPLY FROM INITIAL STOCKS OF 400,000 TONS.



46	92	138	188	237	286	338	389	440	486	532	577	REQUIREMENT.
5	12	20	29	42	62	90	125	175	240	310	390	NEW SUPPLY
359	320	282	241	205	176	152	136	135	154	178	213	STOCKS



BASED ON ESTIMATES OF
NOVEMBER 25, 1942

WAR PRODUCTION BOARD
OFFICE OF THE RUBBER DIRECTOR
PROGRESS REPORT NUMBER ONE

completion date; for third and fourth units production starts month following plant completion date—butadiene and styrene at rate of 20% first productive month; 40% second; 60% third; and 100% thereafter. Butyl, neoprene, and "Thiokol" at rate of 40% capacity first productive month; 75% second; and 100% thereafter. Copolymer production estimates the same basis as third and fourth units and according to butadiene and styrene rates up to September 1 and butyl production rates thereafter. Butyl and neoprene expressed in terms of equivalent crude by assuming non-wear usage and multiplying production by utility factor. Buna S and "Thiokol" expressed in terms of equivalent crude by assuming non-wear usage and multiplying production by utility factor. Buna S and "Thiokol" expressed in terms of equivalent crude by assuming wear usage and multiplying by use factor.

Initial Stocks

Stocks at beginning of 1943 assumed to approximate 400,000 long tons. This estimated from October 1, 1942, inventories

and estimates of imports, essential requirements, and small synthetic production during last quarter of 1942.

From the above, it is clear that there is every necessity for continuing through the critical Fall of 1943 a policy of rigid conservation of rubber, and that we must envisage the possibility of a complete exhaustion at that time of even so-called normal inventories of finished products. In fact, a delay of a month in the part of the program which includes plants that should be finished by May 30 would mean the loss of 40,000 to 50,000 tons, at a time when there will be none to lose. Present indications are that the impact of competitive programs will cause a delay. It is too early to say how much of a delay.

A scheduling mechanism, now being put into effect, may solve part of the problem and the Office of the Vice Chairman in Charge of Program Determination of WPB is cooperating with us. Nevertheless, I am informed that, although the only sure solution of the Rubber problem is to subordinate other important programs to it, the

demands of the Services make this impossible. This is in direct conflict with my understanding and conviction that the President's Executive Order of September 17, 1942, and its accompanying letter endorsed unequivocally the Baruch Report, its program and its statement, "Thus the rubber situation gives rise to our most critical problem."

Program Expansion

The Baruch Committee recommended certain plant expansion. New plants to provide the desired increase in neoprene and "Thiokol" capacity are being started. Currently, existing copolymerizing plants promise to provide the required capacity in that direction. However, shortages of raw materials will forbid running these to even rated capacity for another year; hence, no further copolymerizing plants will be started for another six months.

Final arrangements have been made for a portion of the recommended 100,000 tons a year additional capacity of butadiene from refinery conversions. Engineering work, together with pilot studies, will permit completing arrangements for the remaining capacity as rapidly as necessary critical materials can be obtained without disrupting other phases of the construction program.

The Baruch Report recommended the erection in grain-producing states (preferably accessible to water transportation) of facilities for the manufacture of 100,000,000 gallons per year more alcohol than was then contemplated by the Chemicals Branch of the War Production Board. In making this recommendation, they had in mind that plants being erected to make from alcohol the butadiene for 242,000 long tons per year of Buna S might run at enough higher than rated capacity to utilize most of this additional alcohol. Furthermore, they emphasized that there must be enough alcohol to preclude the possibility of increased demands from smokeless powder and other munitions industries diverting alcohol from the rubber program.

After all, far more of the country's industrial alcohol is used for other military and civilian purposes than is required for the rubber program.

The Chemicals Branch of the War Production Board has been directed to provide these additional facilities for alcohol production, and has been given estimates of the quantities of alcohol that the butadiene and styrene plants now under construction could consume during the period estimated as necessary for the building of new alcohol producing facilities. The Chemicals Branch states that present facilities and stocks are such that, with present anticipated needs of alcohol, there is no reason for them to expedite the new facilities at the expense of the plants now under construction. They assure us that these new facilities will be available before the plants to consume the alcohol are operating at capacity.

Plans for building plants to make an additional 30,000 tons per year of Buna S from butadiene made from grain are being studied by my technical staff. It is expected that their studies will be sufficiently complete to permit building these as soon as possible after adequate piloting of the processes which the Baruch Committee recommended investigating. This step must also depend on avoiding serious conflict with the flow of materials to plants now under construction for our program.

The recommendation that additional styrene capacity be ready by January 1, 1944, to balance upwards the increased annual production of Buna S, is being watched.

But, since, because of lack of materials, the construction of the butadiene plants in the main program is behind that envisioned by the Baruch Report, decision upon this increased capacity has been postponed.

Russia

The Baruch Report stressed the importance of promptly securing detailed technical information concerning the successful manufacture of synthetic rubber in Soviet Russia. This office immediately accepted the offer of the Soviet Republic to make complete disclosure and selected a small group of competent and technically qualified experts to proceed to Russia and report on all phases of this operation. This group has been assured complete cooperation by our Russian Allies and a similar group from the Soviets will come to this country to study our methods and receive reports on our research and technical developments.

Need of Informing the Public

There is still a pronounced lack of public understanding of the rubber situation.

Many do not yet understand that it is essential to our war effort and a prime duty of the Rubber Director to keep on the roads that portion of our essential transportation system which is dependent on our public and private motor vehicles.

They do not understand the vital importance of making their present tires last, nor do they comprehend the sacrifices in convenience driving and pleasure driving which must be made, if each man's own car is to continue at his own disposal for the essential driving our whole war economy demands.

In much of the newly rationed area, they do not fully understand that gas rationing is undertaken solely to conserve rubber. In many sections they resent gas rationing and will continue to resent it, and oppose it, until they have been made to see that less gas means less driving; that less driving means the preservation of their own tires for their own use against that period some time in 1944 when further supplies of rubber should become available for civilian tires. Only when this rubber is available can rationing be relaxed.

In brief, the public does not yet understand that the vast majority of our motor vehicles must run from now until mid-1944 on the tires now in use, nor that they share with the Rubber Director the duty of each keeping his own car in useful operation. On the contrary, a large part of the public have been led to believe that certain regulations for the control of tire supply insure that on December 1, tires of one or another kind (or recaps) will become available to all who need them.

The need of more information to the public in these points, as well as on such related subjects as the means of tire preservation, limitation of driving speed, and share-the-car arrangements are self-evident. To obtain the public support, it will be necessary to find a way by which the OPA, ODT and OCS will all spread a uniform message. This message must be dictated by the Rubber Director.

If confusion can be disposed of and the public is made to realize that rationing is for their own protection and comfort as well as for the war effort, much will have been accomplished toward insuring the rubber program. Unless this is done, publicity stemming from a multiplicity of agencies will cause further confusion and will preclude the possibility of willing acceptance by the public of rationing and of cooperation in other phases of the program which are essential to success.

Basic Policy Decisions

Though there is no necessity to dwell upon the individual decisions incident to acceptance of many of the recommendations of the Baruch Report, the following are worthy of comment:

The Committee emphasized that there must be an improvement in the supply of materials to plant and equipment fabricators. They made it clear that without such a change, insufficient rubber would be produced in 1943. We have found the shortages to be in fabricated components (such as instruments, forgings, valves, heat exchangers, etc.), more than in materials. Our studies have emphasized that unless these components for synthetic rubber manufacturing plants reach the plants as rapidly as they can be installed the resultant delay will cause such a drain on the crude rubber stocks that there may be no crude left for heavy-duty tires, self-sealing gasoline tanks, and those other military uses which demand crude rubber. The decision as to whether this can be accomplished without too serious delay is in the hands of those who have also to consider other programs, including the program for the building of plants producing high-octane gasoline. Some of these call for the same critical materials. The final solution is not yet developed. The rubber program is receiving notable help in obtaining priorities and critical materials. But its relationship to other programs endangers its completion in time to avoid a crisis and I am not hopeful.

The Baruch Report envisioned the possible desirability of implementing the Rubber Director's Office with funds for carrying out its own work, as well as for some of the work now done by other agencies. As yet, there has been no necessity to request these.

Rubber Reserve Co.

To aid the flow of materials and to facilitate obtaining priorities, an Assistant Deputy Director has taken over from Rubber Reserve the direction of plant construction.

We have also taken over from Rubber Reserve, under another Assistant Deputy Director, the direction of research, engineering development, and piloting of processes for the manufacture of synthetic rubber and its raw materials. However, we have been careful to leave with Rubber Reserve their technical staff necessary for the control of the quality of raw materials and finished products for and from Government-owned plants under contract with them. In accordance with the Baruch Committee recommendation, Rubber Reserve is arranging for three of the standard copolymerization plants to be run by groups of smaller companies, and arrangements have been made to relax the secrecy provisions of certain of their contracts so that progress shall not be hindered.

Board of Economic Warfare

Arrangements have been made with the Board of Economic Warfare for a joint committee to visit Haiti to study the possibilities of obtaining rubber from *cryptocarya*. They are now on the ground.

Office of Petroleum Coordinator

The Office of Petroleum Coordinator is being charged by me with responsibility for recommending new projects for the manufacture of butadiene from petroleum and for assisting Rubber Reserve and Defense Plant Corp. to draw contracts covering the building and operation of Government-financed facilities. They will also

present to this office the necessary requests for priorities and allocations incident to refinery conversions. They are responsible as well for seeing to it that necessary petroleum feed stocks are ready and are available when needed, and for aiding in problems of operation that may arise because of the close inter-relationship of isobutylene and butadiene manufacture to other petroleum refinery operations. They are strengthening their technical staff and taking over responsibility for research and development in connection with the manufacture of butadiene from petroleum. The Committee recommended that funds be provided for this technical work, and in the absence of arrangements to the contrary, this office is having the funds for piloting operations provided, where necessary, by contract between research and development agencies and Rubber Reserve.

Office of Defense Transportation

This agency, in accordance with the recommendation of the Baruch Report, has been directed to limit the speed of motor vehicles to 35 miles per hour and to determine the needs of all commercial vehicles for gas and tires.

Office of Price Administration

In accordance with carefully elaborated recommendations of the Baruch Committee, the OPA has taken steps to limit civilian driving by the rationing of gasoline, to enlarge the present allotments of new and used tires of various descriptions, and to issue certificates for more retreading of worn tires. The OPA is responsible for a wider acceptance of "car pooling" as well as for periodic inspection of tires and a better understanding of the necessity of properly maintaining tires now in use. Under directive from me, they have arranged to buy those tires in excess of five which are owned by owners of passenger vehicles.

"All-reclaim" tires have been made for allocation by OPA, but it is still too soon for this office to state how much reclaim will be available for the manufacture of these tires after as much as possible of it has been used for the recapping of existing tires.

Steps are now being taken looking toward the best use of all reclaim available for the recapping of worn tires before their fabric has been so worn that the carcass is no longer recappable. To this end, it is planned to use to the maximum the facilities of all field recapping stations. Consideration will be given to the enlarging of some and the best use of molds and equipment to meet the problems that will arise as "Thiokol" comes into the picture.

There has been much confusing publicity in connection with the availability of "all-reclaim" tires and the meaning of the word "essential" driving. It is imperative that rationing boards and the public both realize that available reclaim should wherever possible be used to recap tires before their fabric has been worn through so that they are no longer recappable.

We are rapidly approaching the time when our office must require certain manufacturers to use synthetics costing them much more per pound than the 22½¢ now charged for crude rubber. Unless there is to be a complete dislocation and demoralization of various parts of the rubber industry, it will be necessary either to compensate for this by subsidies or to permit an equitable adjustment of selling prices. The problem of how this can be accomplished without dislocation of the rubber program has still to be determined in connection with Rubber Reserve and the OPA.

Department of Agriculture

The Baruch Report recommended a large increase in the program for guayule, and the Department of Agriculture is taking steps to effectuate their recommendations. 88,000 acres of plantations will be established this winter. These are expected to provide 33,000 tons of rubber late in 1944 and early in 1945. It is planned to establish another 120,000 acres next winter to produce an additional 47,000 tons of rubber in the harvest of 1945-1946. The request for priorities for critical materials incident to this program is now under examination and final determination will be agreed upon in the near future.

Two regional laboratories of the Department of Agriculture are working on the problems incident to the extraction of rubber from guayule, *cryptostegia*, Russian dandelion, goldenrod, etc. At the Eastern Laboratories in Philadelphia, 65 men are working on these problems.

Plant Construction

The primary responsibility here is that of overseeing plant and engineering construction. This involves special attention to insuring a minimum use of critical raw materials, and an even flow of raw materials to fabricators, and fabricated articles to plant sites. This operation also includes obtaining the priorities and allocations necessary if plant facilities are to be built in time. The situation pertaining to these problems has been discussed in some detail in the early section entitled "Program."

To facilitate the work of this section, every effort is being made to freeze designs. The recommendations of the Committee that certain pilot plants be established are being followed and every effort is being made to complete one large-scale plant on the Standard Oil of New Jersey process of butadiene by March, 1943.

The Baruch Committee emphasized the desirability of completing as soon as possible one standard copolymerization plant. It is expected that the first of these units will be finished in March. To finish one earlier would necessitate changes and interruptions which might result in almost disastrous delays to more critical portions of the program.

Facilities for the manufacture of considerable tonnage of Buna S by what is essentially standard plant design are already finished. These units are being run at less than one-fifth of their capacity because of the present unavailability of butadiene. Because of this shortage, all emphasis is upon bringing into production the first increments of butadiene and styrene. It is expected that the first butadiene will come from the first of the four units of the alcohol plant at Institute, W. Va., and that this will be followed closely by the first increment of butadiene from petroleum at Baton Rouge, La. It is hoped that both of these will be producing early in the year. Unfortunately, these increments constitute only a little more than 5% of the ultimate program.

Operations

Under "Operations" come all of the many functions of my office which have to do with rubber and closely related industries. In order that these operations may be efficiently carried out so as to conserve a maximum of rubber with a minimum dislocation of industry and labor, and of the needs of the armed services and other essential users of rubber, the organization of this group comprises many experts from various parts and units of the rubber industry. These experts have

been chosen from both large and small manufacturers. Some are full-time members of the staff; others are acting as advisers.

The Baruch Committee emphasized the necessity of scrutinizing all requirements for rubber. We have inaugurated a plan to obtain detailed requirements from all the claimant agencies for end products of rubber or rubber substances to meet actual schedules of production of airplanes, trucks, ships and other products requiring rubber or rubber-like materials. This survey, which will be kept up-to-date monthly, together with our newly inaugurated survey of all inventories of all end products, will enable us shortly after the first of the year to control properly the consumption of natural rubber, synthetics and substitutes, and to regulate them by the possible liquidation of less-essential inventories of end products, in such a way as to conserve our diminishing stockpile of natural rubber.

We have taken the necessary steps to consolidate within the Office of the Rubber Director all important statistics with reference to rubber, with the understanding that only such reports as emanate from the Office of the Rubber Director will be considered authentic. This procedure should tend to relieve the confusion which has existed in the past as a result of so many different agencies of the Government and others compiling and releasing figures and other information regarding the rubber situation.

While the specific delegation to the Rubber Director of those priority powers affecting rubber necessary to discharge the responsibilities with which I am charged has not been completed, this is now being done. As soon as it is, this section will take over, in their entirety, the complicated problems incident to the detailed allocations of various crude rubber, synthetic rubbers, and rubber substitutes, and various grades of reclaim to be used for specific items, in such a way as to realize the maximum and most effective uses of each in effectuating the program as a whole.

The Baruch Report recommended that a survey of milling, mixing and tire-building facilities be made on or about May 1, 1943. Before another month we shall have complete engineering information covering milling and calendering equipment from practically all of the rubber industry. This will enable us promptly to complete the recommended survey, to the end that we may specify necessary and essential increases in milling and fabricating capacity in time to handle the increased requirements necessary when synthetic rubber is used in place of crude.

Within a month, a similar survey of reclaiming plants will be available in connection with the Baruch Committee's recommendation that reclaiming capacity be increased by about 20%. Reclaimers estimate that we may expect these proposals to provide for an increase of about 10% by the elimination of "bottlenecks" in existing reclaiming plants, by changes in specifications in desired types of reclaim, and by the elimination of unnecessary types.

In accordance with the recommendation of the Baruch Committee, we are proceeding with the preparation of a new drive for scrap to be inaugurated whenever the scrap is needed to maintain an adequate scrap pile. Meanwhile, the supply is coming in automatically as tires are rationed to users who are turning in their worn-out tires and by the restriction against the possession of more than 5 tires per vehicle.

The functions of the Board of Economic Warfare, Rubber Reserve and the State

Department, in the development and procurement of natural rubbers from South and Central America, are confused. I am studying this situation and hope to determine a clear and definite program under which these agencies will operate.

Problems of Civilian Supply as they pertain to the organization of WPB will receive further attention.

Research and Development

The Baruch Report recommended the establishment of a technical division, adequately staffed and with branches in charge of all phases of research and development (except for the production of butadiene from petroleum). It advised that there should be an interchange of information among those engaged in a competitive spirit in research, development and operation. A strong technical group of thoroughly competent, experienced, outstanding men has been gathered together under three Assistant Deputy Directors. These are discussed separately below.

Technology and Specifications for Industry Uses

This is the problem of technology and specifications governing the use of selected synthetics for each type of product now made from rubber. Since some of the proposed synthetics and substitutes may be available earlier than others, the saving of a maximum amount of crude rubber may involve, in the case of a single article, first using one substitute or synthetic and later switching to another. Much has already been done, but there is still a Herculean task ahead. Needless to say, results depend upon obtaining the full cooperation of industry and a close and constant working relationship with the statistical, allocations, and industry advisory groups of the operating section. Also concerned is the research group working upon improving the quality of the available synthetics. The practical problems of this section will be closely tied to the policies which will govern the pricing of synthetics and products made from them. Unless these provide an incentive to use synthetics, many of the weaker units are bound to hold back.

The staff of this section, made up of thoroughly competent men (at present there are sixteen) recruited primarily from both large and small units of the rubber industry, help by advising with the industry.

Research and Development of Synthetics

The Baruch Committee recommended centering all research for and upon synthetic rubber and substitutes in the Office of the Rubber Director. To accomplish this, the work of this group was organized under men of proven competency and scientific reputation into groups dealing with:

- (1) Research into the mechanisms of various polymerizations, and the character and structure of resulting polymers.
- (2) Studies of and development of polymerization processes.
- (3) The engineering of polymerization plants and equipment.
- (4) The operation of pilot plants for the development of new methods of polymerization and new copolymers.
- (5) The appraisal of new ideas and inventions.

Research and Development of Raw Materials

This section is responsible for the development of processes to make raw materials other than isobutylene, butadiene,

(Continued on page 418)

Patents and Trade Marks

APPLICATION

United States

2,300,431. Grinding Wheel Dresser with Coolant Bulb and Tube. J. P. Murray, Lynn, Mass.
 2,300,475. Silent Ventilating Ceiling Unit with Rubber Sound-Deadening Cushions and Motor Supports. E. T. Ward, River Forest, Ill.
 2,300,498. Tire Inflation Valve with Yieldable Stem. W. F. Goff, Akron, assignor to Ohio Injector Co., Wadsworth, both in O.
 2,300,584. Tube Coupling with a Cushion Sleeve. O. C. Martin, Los Angeles, Calif.
 2,300,679. Spray Device with Flexible Nozzle. F. Klein, Bayville, L. I., N. Y., assignor to Keystone Brass & Rubber Co., Philadelphia, Pa.
 2,300,681. Shoe Sole with Resilient Insert. M. Margolin, Elgin, Ill.
 2,300,706. Power Transmission Belt with Steel Core and a Rubber Sheath Bonded thereto. W. L. Schott, Los Angeles, Calif.
 2,300,722. Hydraulic Pressure Fluid Accumulator with an Elastic Wall Separating a Primary and a Secondary Chamber in the Dual-Pressure Tank. H. W. Adams, and E. S. Kleinhaus, assignors to Douglas Aircraft Co., Inc., all of Santa Monica, Calif.
 2,300,726. Crutch Tip. P. F. Douglas, Carman, Man., Canada.
 2,300,738. Recoil Pad for a Gun Stock with a Resilient Member. A. H. Ammann, Peotone, Ill.
 2,300,739. Fabricated Insole with a Forepart Element of Cork and Latex Bonded together, and a Sheet of Substantially Nonstretchable Material Cemented to One of the Surfaces. M. L. Brown, Vaucuburg, Ky., assignor to L. V. Marks & Sons Co., Cincinnati, O.
 2,300,832. Milking Machine Teat Cup. W. A. Scott, Poughkeepsie, assignor to De Laval Separator Co., New York, both in N. Y.
 2,300,887. Foundation Garment. M. Goodman, assignor to Neatform Co., Inc., both of New York, N. Y.
 2,300,912. Gas Mask. H. M. Dodge, Wabash, Ind., and H. T. Kraft, Akron, O., assignors to General Tire & Rubber Co., Akron.
 2,301,009. Mechanical Hand Finger, Including a Hollow Tubular Rubber Sleeve Shaped to Simulate a Finger. D. B. Becker, St. Paul, Minn.
 2,301,087. Bottle Cover of Heat-Sealable Thermoplastic Film. J. E. Snyder, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.
 2,301,096. Rubber Sealing Ring for Sealing a Circular Crack between Two Members Confining a Fluid under Pressure. R. L. Tweddale, assignor to Vickers, Inc., both of Detroit, Mich.
 2,301,128. Bag of Plasticized Rubber Hydrochloride Film and Unplasticized Rubber Hydrochloride Film Coalesced together at the Bottom in a Flat Seam. A. F. Landefeld, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.
 2,301,216. Bottle Holder Utilizing Two Elastic Ring-Like Rubber Bands. E. J. Koonitz, Richards, Mo.
 2,301,323. Atomizer with Bulb. H. F. Reichlebach, assignor to Chase Brass & Copper Co., Inc., both of Waterbury, Conn.
 2,301,372. Friction Absorbing Side Bearing Structure with a Resilient Member. R. B. Cottrell, assignor to American Steel Foundries, both of Chicago, Ill.
 2,301,380. Drip Catching Attachments for Umbrellas with Vacuum Cup Portion on the Extending End. C. D. De Lamater, San Diego, Calif.
 2,301,426. Splint-Forming Material Comprising a Fibrous Base Impregnated with a Normally Hard Thermoplastic Composition Consisting of Carnauba Wax, Candelilla Wax, and Vulcanized Rubber. S. P. Lovell, Newton, assignor to Castex Laboratories, Inc., both in Watertown, Mass.
 2,301,483. Airplane Fuel Tank Safety Device, Including a Rubber Surface on the Inner Wall of the Tank. G. Van Daam, Buffalo, N. Y.
 2,301,540 and 2,301,541. Hosiery with a Zone Incorporating Elastic Rubber Yarn. L. B. Herb, Wyomissing, assignor to Vanity Fair Silk Mills, Reading, both in Pa.
 2,301,552. Oscillating Safety Razor Having a Rubber Sealing Member. G. E. La Cell, Santa Rosa, Calif.
 2,301,569. Anti-Skidding StudDED Tire. M. Muecklich, Dresden, Germany; vested in the Alien Property Custodian.
 2,301,596. Mattress Having a Padding Comprising Loose Fibers, and Particles of Sponge Rubber Interspersed Only through That Portion nearest the Springs. H. E. Wells, assignor to Warren-Wells Co., both of Detroit, Mich.
 2,301,654. Shaft Sealing Means Utilizing a Re-

silient Bushing. R. B. Vauch, assignor of 50% to E. P. Harlow, both of Battle Creek, Mich.
 2,301,673. Rattle with a Suction Cup Attachment. P. E. Allen, Skokie, Ill.
 2,301,724. Pressure Cooker Having a Pressure Relief Device Comprising a Soft-Rubber Plug. A. Vischer, Jr., Park Ridge, assignor to Vischer Products Co., Chicago, both in Ill.
 2,301,783. Electrical Conductor for Pipes with Resilient Insulating Means. R. E. Lee, Coleman, Tex.
 2,301,809. Tire for a Wheel Having Elongated Flexible Prongs Projecting from an Annular Band of Elastic Material and Prevented from Radial Inward Movement by an Auxiliary Annular Metal Plate. E. Ovalle, Santiago, Chile.
 2,301,818. Resilient Motor Support. K. G. Sackett, Cambridge, assignor to B. F. Sturtevant Co., Boston, both in Mass.
 2,301,843. Hand Grip for Use on Rope-Type Ski Tows. Comprising a Mitten Portion and a Flexible Rubber Portion Secured to the Mitten Portion. E. G. Abdella, Gloversville, N. Y.
 2,301,881. Garment Shield Having a Pocket Adapted to Receive Absorbent Material. G. Kalenoff, Brooklyn, N. Y.
 2,301,888. Rivet Set Having a Resilient Sleeve. E. B. Lear, Garfield Heights, assignor to Cleveland Pneumatic Tool Co., Cleveland, both in O.
 2,301,934. Track Shoe with at Least One Resilient Lug. H. A. Knox, Washington, D. C.
 2,301,993. Oil Seal with Resilient Sealing Member. J. A. Antonelli, Elgin, assignor to Victor Mfg. & Gasket Co., Chicago, both in Ill.
 2,302,003. Static-Discharging Floor Covering Incorporating Electrically Conductive Rubber Composition. E. N. Cadwell, Grosse Pointe City, and L. Marick, Grosse Pointe Farms, both in Mich., assignors to United States Rubber Co., New York, N. Y.
 2,302,027. Tire Tread. G. G. Havens, Detroit, Mich., assignor to United States Rubber Co., New York, N. Y.
 2,302,041. Flexible Doll Head with Eyes. S. Marcus, Jersey City, assignor to Margon Corp., Bayonne, both in N. J.
 2,302,109. Vane-Type Piston for a Fluid Pressure Motor. H. M. Dodge, Wabash, Ind., assignor to General Tire & Rubber Co., Akron, O.
 2,302,200. Packaging Cheese Using a Mixture Including Wax Modified with Rubber Derivative and Wrapping the Coated Cheese Batch with a Regenerated Cellulose Sheet. H. Fassbender, Kaukauna, assignor to Milprint, Ind., Milwaukee, both in Wis.
 2,302,216. Foundation Garment. G. E. Hawes, Bridgeport, Conn.
 2,302,227. Nut Cracker and Sheller Having Opposite Compressible Surfaces. M. Kasser, San Francisco, Calif.
 2,302,368. Shooting Jacket with a Shoulder Pad of Sponge Rubber. B. A. Evans, New York, N. Y.
 2,302,400. Plastic and Viscous Material Mixing Device Having a Resilient Body Mounted in a Casing Having a Tortuous Passage, and a Resilient Discharge Tube. A. L. Stone, assignor to Pneumatic Co., Inc., both of Los Angeles, Calif.
 2,302,443. Teat-Cup Construction. F. G. Hodsdon, Milwaukee, Wis., assignor to International Harvester Co., a corporation of N. J.
 2,302,480. Rubber Covered Hair Curler. A. Tara, San Francisco, Calif.
 2,302,694. Parachutist's Shoe with Cushioning Inner Sole Applied over and Secured to the Outer Sole of the Shoe. R. W. Jennings, Cambridge, Mass.
 2,302,706. Ventilated Insole Combination Having Resilient Rubber Layers. M. Margolin, Elgin, Ill.
 2,302,799. Device for Admixing Liquid Solutions Prior to Their Distribution Having a Closure Formed of Flexible and Elastic Material. E. Peterson, Dearborn, Mich.
 2,302,802. Bowling Ball Carrier Containing a Molded Rubber Ring to Support the Ball. E. G. Roberts, Oak Park, Ill.
 2,302,816. Planographic Printing Using Water-Receptive Non-Printing Portions of Polyvinyl Alcohol. W. C. Toland and E. Bassist, Brookline, Mass., assignors to Toland, as trustee.
 2,302,817. Planographic Printing Plate Comprising Non-Printing Portions of Water-Receptive Polyvinyl Alcohol and Printing Portions Comprising Grease-Receptive Polyvinyl Alcohol Obtained from a Solution of Polyvinyl Alcohol Polymers Containing No Cold-Water-Solubles. W. C. Toland, Brookline, Mass., and B. B. Burlbank, Brunswick, Me., assignors to Toland, trustee.
 2,302,839. Electric Cable with an Internal Flexible Insulating Material Disposed Radially between Each Conductor and Adjacent Conductor. L. S. Burgett, Euclid, assignor to Clark Controller Co., Cleveland, both in O.
 2,302,843. Maternity Girdle. L. C. Dorion, Jamesville, N. Y.

2,302,934. Model Red Blood Cell of Enlarged Size of Elastic Moldable Material. A. Barol, assignor to John Wyeth & Brother, Inc., both of Philadelphia, Pa.
 2,303,120. Backing for a Glass Chalkboard. Comprising an Adhesive Material Including a Concentrated Latex Paste and a Dehydrating Powder. A. McK. Greaves-Walker, deceased, late of Toledo, O., by A. M. Greaves-Walker, executrix, assignor to Libbey-Owens-Ford Glass Co., both of Toledo.
 2,303,164. Tire Having Very Thick Annular Shoulder Tread Portions Radially Inwardly and Having Circumferentially Spaced Series of Outwardly Extending Slots and Ribs. P. E. Hawkenson, Minneapolis, Minn.
 2,303,302. Carpet Comprising a Felted Fiber Ease, a Woven Fabric Surmounting the Base whereby a Plurality of Felted Fibers Extend through to the Upper Surface, a Layer of Rubber Calendered to the Upper Surface of the Fabric and Vulcanized So As to Lock the Extending Felted Fibers, a Layer of Cement upon the Rubber, and a Tread Surface of Pile Fibers Adhering to the Cement Layer. H. P. Faris, Philadelphia, Pa., and D. W. Yochum and R. B. Logan, both of Trenton, N. J., assignors to National Automotive Fibres, Inc., Detroit, Mich.
 2,303,381. Armored Marine Cable Having a Layer of Rubberized Fabric. G. A. Johnson, Irvinston, N. J.
 2,303,359. Sealed Container with Vent Hole Having Serrated Edges and a Resilient Rubber Plug. J. M. Mothersall, Brooklyn, N. Y., assignor to American Can Co., New York, both in N. Y.
 2,303,384. Tubular Sleeve Connector for Cable Wires. C. S. Penfold, assignor to H. A. Douglas Mfg. Co., both of Bronson, Mich.
 2,303,393. Vacuum Lifting Device with Resilient Suction Cup. E. Schmidt, Oak Park, Ill., assignor to C. O. Moore.
 2,303,502. Draft-Proof Shower Curtain Comprising a Suction Cup Supporting Clamping Jaws. B. Rous, New York, N. Y.
 2,303,548. Mercury Relay with Resilient Gasket Means Engaging over the Electrode. U. C. Helin, Des Moines, Iowa, assignor to Bucklen-Bear Laboratories, Inc., Elkhart, Ind.
 2,303,553. Tiltable Fan Support with Semi-Soft Rubber Standard and a Flexible Element Embedded therein Permitting Bending the Standard by Manually Applied Force. M. W. Humphreys, Euclid, O., assignor to Ohio Rubber Co., Willoughby, both in O.
 2,303,567. Resilient Bicycle Seat Mounting with Rubber Cushioning Disks. J. F. McWhorter, Cleveland Heights, and M. W. Humphreys, Euclid, assignors to Ohio Rubber Co., Willoughby, all in O.
 2,303,568. Resilient Bicycle Wheel Mounting with Resilient Rubber Disk Vulcanized to Two Metal Disks. J. F. McWhorter, Cleveland Heights, and M. W. Humphreys, Euclid, assignors to Ohio Rubber Co., Willoughby, all in O.
 2,303,578. Closure for a Cleaning Machine. Having a Soft Rubber Sleeve. H. C. Porter, assignor to Bendix Home Appliances, Inc., both of South Bend, Ind.
 2,303,617. Ice Tray Having a Cover with Soft Flexible Rubber Depending Projections Which Form Spaced Perforations in a Frozen Substance. H. B. Copeman, assignor to Copeman Laboratories Co., both of Flint, Mich.
 2,303,642. Pressure Sealed Coupling. T. J. Hoy, Newark, N. J.
 2,303,660. General Utility Brush with Sponge-Like Element on a Curved End Portion. E. M. Schickel, Lincoln, Neb.
 2,303,670. Trolley Stanchion with an Anchor Comprising a Spindle and an Insulator over the Spindle. C. H. Turner, Worcester, Mass., assignor to Pullman-Standard Car Mfg. Co., Chicago, Ill.
 2,303,694. Windshield Cleaner. E. C. Horton, Hamburg, assignor to Trico Products Corp., Buffalo, both in N. Y.
 2,303,744. Athletic Footgear with Resilient Cleats. M. Jacobs, Jersey City, N. J.
 2,303,759. Chalkboard Eraser with Sponge Rubber Blocks. W. G. Pippin, assignor to Slip-Not Belting Corp., both of Kingsport, Tenn.
 2,303,762. Wet Material Conveyor Belt with a Work-Supporting Face of Rubber-like Material. S. R. Reimel, Akron, and J. F. La Rue, Cuyahoga Falls, both in O., assignors to B. F. Goodrich Co., New York, N. Y.
 2,303,938. Sharp Freezing Container with Removable Rubber Grid Structure. H. Y. Jennings, Cho, assignor to Copeman Laboratories Co., Flint, both in Mich.

Dominion of Canada

408,183. Decorticating Machine for Treating Fibrous Material, with an Anvil Having a Resilient Working Face. A. Burkardt, New York, N. Y., U. S. A.
 408,186. Combined Cushion and Life-Belt. H. S. Crabtree, Caterham, Surrey, England.
 408,213. Respirator Having a Microporous Rubber Filtering Material. American Optical Co., Southbridge, assignee of W. H. Lehmberg, Dudley Hill, both in Mass., U. S. A.

408,220. **Railway Car Coupler Support with Rubber Cushioning Unit.** Edward G. Budd Mfg. Co., assignee of H. K. Harwick, both of Philadelphia, Pa., U. S. A.

408,290. **Floor Mop with Sponge Rubber Pad.** United States Rubber Co., New York, N. Y., U. S. A.

408,302. **Refrigerator Car Door with Resilient Sealing Material around the Edges.** Youngstown Steel Door Co., Cleveland, O., assignee of C. E. Ekland, now deceased, in his lifetime of Chicago, Ill., both in U. S. A.

408,392. **Machine Gun Belt Guideway with Rubber Beads on the Guide Members.** Dunlop Rubber Co., Ltd., assignee of G. C. Brentnall, both of London, England.

408,418. **Decorated Fabric Comprising a Laminated Structure Having a Collapsible Embossed Portion and Formed of Cloth, Soft Rubber, and Paper in Superposed Layers.** National Automotive Fibres, Inc., assignee of G. R. Cunningham, both of Detroit, Mich., U. S. A.

408,436. **Collapsible Inflatable Boat.** Wingfoot Corp., Wilmington, Del., assignee of J. F. Cooper, Akron, O., both in the U. S. A.

408,437. **Dual-Chambered Safety Tire Tube.** Wingfoot Corp., Wilmington, Del., assignee of P. J. Truscott, Akron, O., both in the U. S. A.

408,438. **Bottle Cover Formed from Two Flat Portions of Film.** Wingfoot Corp., Wilmington, Del., assignee of J. E. Snyder, Akron, O., both in the U. S. A.

408,550. **Means for Conducting Anti-Freeze Liquid along the Leading Edge of a Propeller Blade.** B. F. Goodrich Co., New York, N. Y., assignee of W. H. Hunter, Akron, O., both in the U. S. A.

408,551. **Storage Battery Cell Cover Utilizing a Collapsible Tubular Valve Member of Resilient Rubber.** B. F. Goodrich Co., New York, N. Y., assignee of R. C. Stumps, Melford, and P. J. Harriman, Newtonville, co-inventors, both in Mass., both in the U. S. A.

408,761. **Rubber Heel.** J. F. Anderson, Chicago, Ill., U. S. A.

408,791. **Railway Vehicle Snubber Having a Solid Block of Rubber between the Friction Shoes.** American Steel Foundries, assignee of D. M. Light, both of Chicago, Ill., U. S. A.

408,856. **Window Channelling Having a Flexible Metal Core.** General Tire & Rubber Co., Akron, O., assignee of R. J. Bush, Wabash, Ind., both in the U. S. A.

408,857 and 408,858. **Resilient Tire for a Free-Rolling Guiding Wheel for a Tractor or Farm Vehicle, Having a Single Projecting Rib Circumferential on the Tread Portion.** B. F. Goodrich Co., New York, N. Y., assignee of W. H. Elliott, Akron, O., both in the U. S. A.

408,875. **Flexible Waterproof Abrasive Article Comprising a Sheet of Woven Fibrous Material and Two or More Coatings of Different Materials, the Coatings Comprising a Heat-Convertible Phenolic-Aldehyde Resin Having Abrasive Grits Embedded therein, and an Ethylene Dichloride Sodium Polysulphide Resinous Substance Impregnating the Fibrous Backing.** Minnesota Mining & Mfg. Co., assignee of B. J. Oakes, both of St. Paul, Minn., U. S. A.

408,902. **Water Saturable and Absorbent Sponge Rubber Wash Cloth.** United States Rubber Co., New York, N. Y., assignee of C. J. Schellings, South Bend, Ind., U. S. A.

408,916. **Tire with Pressure Indicator Located on the Side wall, Comprising Openings Which, upon a Change of Pressure from the Normal, Distend to Reveal a Colored Inner Ply.** E. S. Stanton, inventor, and A. I. Moran, assignee of one-half of the interest, both of Brooklyn, N. Y., U. S. A.

United Kingdom

548,200. **Rubber and Metal Units for Resilient Mountings, Couplings, Etc.** Metalastik, Ltd., and M. Goldschmidt.

548,299. **Corsets, Etc.** R. S. Holt.

548,284. **Babies' Pacifiers.** E. I. Drake.

548,316. **Deicers.** Flight Refuelling, Ltd., and Sir A. J. Cobham.

548,528. **Camouflage Materials and Devices.** E. C. Maxwell and North British Rubber Co., Ltd.

548,657. **Coreless Golf Balls.** United States Rubber Co.

548,707. **Shoots for Feeding or Conveying Ammunition, Etc.** Dunlop Rubber Co., Ltd., and H. Trevasaki.

548,708. **Electric Cables or Wires.** Standard Telephones & Cables, Ltd., J. F. Morely, D. R. Beckwith, and W. J. L. Wildbore.

PROCESS

United States

2,300,441. **Inflatable and Deflatable Athletic Ball.** W. J. Voit, Los Angeles, and L. C. Weimer, Southgate, both in Calif.; Weimer assignor to Voit.

2,300,760. **Molding Articles from a Packet of Laminations or Felted Fibrous Material Impregnated with Synthetic Resins.** A. Migo, assignor of one-half to Elboneston Industries, Ltd., both of London, England.

2,301,086. **Improvement in the Method of Stretch Wrapping an Article in Heat-Sealable Thermoretractable Film.** J. E. Snyder, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,301,106. **Method of Enclosing an Object in a Thermo-Stretchable Film.** G. M. Brown, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.

2,301,207. **Making an Integral Multiple-Channel Hose by Forming a Plurality of Hose Members. One of Which is Provided with a Flange Extending Longitudinally along One Side, Assembling the Hose in Contact with Another Flangeless Hose, Feeding While So Assembled into a Lead Press, Vulcanizing, and Removing the Lead Mold.** C. D. Garretson, assignor to Electric Hose & Rubber Co., both of Wilmington, Del.

2,301,479. **Rubber Outlet Valves.** N. F. Toolev, Waban, W. E. Glancy, Waltham, and J. M. Holdway, Belmont, all in Mass., assignors to B. F. Goodrich Co., New York, N. Y.

2,301,662. **Forming Flexible Hair Curler Spindles.** W. B. Wilson, assignor, by direct and mesne assignments, to Paris Curler Corp., both of Los Angeles, Calif.

2,302,082. **Manufacture of Tire Fabric Comprising Treating Regenerated Cellulose Yarns, Prepared by Stretching Cellulose Ester Yarns and Saponifying with a Solution of Phthalic Anhydride in Acetic Acid to Esterify the Outer Surface Only, Plying Together a Plurality of the Yarns to Form a Tire Cord, Arranging the Cords in Parallel Relation to Form a Warp Sheet, Coating the Warp Sheet with Rubber to Form a Tire Fabric and Vulcanizing the Rubber.** W. Whitehead, Rye, N. Y., assignor to Celanese Corp. of America, a corporation of Del.

2,302,985. **Football.** W. J. Voit, Los Angeles, and L. C. Weimer, Southgate, both in Calif.; Weimer assignor to Voit.

2,303,416. **Making Heat Exchange Apparatus by Assembling Tubes in Perforated Header Sheets, Placing Sheets of Rubber Material on the Headers Adjacent to the Ends of the Tubes, Supporting the Headers to Resist Pressure Applied, and Vulcanizing under Heat and Pressure.** J. E. Woods, Brookline, assignor to Clifford Mfg. Co., Boston, both in Mass.

2,303,826. **Preventing Sticking of Polyvinyl Acetal Sheets Used in Laminated Safety Glass, by Contacting One Surface of the Interlayers with a Fibrous Sheet Coated with an Anti-Stick Material Consisting of Cellulose Acetate, Regenerated Cellulose, or a Thermosetting Resin.** J. M. De Bell, Longmeadow, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,303,828. **Preventing Sticking of Polyvinyl Acetal Resin Sheets Used in Safety Glass, by Intermingling between the Sheets a Cellulose Plastic Material Having a Fine Grain Matte Surface on One Side.** E. R. Derby, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

Dominion of Canada

408,117. **Method of Manufacturing a Weather Strip Having a Sponge Rubber Bead Secured to an Attaching Strip Which Are Passed through a Path of Rubber Cement to Form a Cover.** Bridgeport Fabrics, Inc., assignee of L. Sprague, both of Bridgeport, Conn., U. S. A.

408,574. **Making a Screenable, Pourable, Dry, Granular Mix by Liquefying a Quantity of Rubber, Mixing It with Abrasive Grains, and Adding No Less Than 25% by Volume of the Bond of an Inert Filler Material, Then Mixing.** Norton Co., assignee of R. H. Martin, both of Worcester, Mass., U. S. A.

United Kingdom

548,209. **Belting.** Dunlop Rubber Co., Ltd., W. Lord, and S. A. Brazier.

548,544. **Forming Small Apertures in Molded Articles.** S. B. Woolf, and R. Woolf & Co. (Rubber), Ltd.

CHEMICAL

United States

2,300,587. **Adhesive Comprising a Partially Depolymerized Chlorinated Polyvinyl Chloride and a Polyvinyl Ether (Polyvinyl Methyl Ether and Polyvinyl Ethyl Ether in Proportions of from about 1:0.7 to about 1:0.4).** A. Menger, Krefeld-Uerdingen, Germany, assignor, by mesne assignments, to General Aniline & Film Corp., New York, N. Y.

2,300,592. **Improving the Adhesion of Rubber**

to Cotton Cord by Applying to the Cord a Dispersion of a Vulcanizable Rubber Composition Containing Pectin; Drying; Bringing the Treated Cord in Contact with Rubber, and Vulcanizing the Assemblage by Heating under Pressure.

L. G. Partridge, Stow, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,300,607. **Plasticizing Synthetic Rubber by Subjecting It to an Oxidizing Treatment in the Presence of an Aromatic Stabilizing Agent Containing an Amino Group (Dimethylamine, 2-Dimethylaminonaphthalene, 2-Dimethylaminonaphthalene, 2-Phenylaminonaphthalene, 2-Tolyl-1-Naphthylamine, 2,2'-Dinaphthylamine, 2,7-Naphthylene Diamine, or 1,4-Di-β-Naphthylamino Benzene) and of a Phenol at Least One Nuclear Hydrogen Atom of Which Is Substituted by Hydrocarbon or Hydroxy Substituted Hydrocarbon Radicals, the Phenol Being Otherwise Unsubstituted.** E. Zaucker, Schkappau, Germany; vested in the Alien Property Custodian.

2,300,606. **Electric Power Cable Containing a Pre-Installation Seal of Oil Pulp Isobutylene Polymers Which Dissolve in Oil When Cable Is Operated; the Oil Is of Such Viscosity That Escape Is Prevented When Cable Is Opened.** F. H. Gooding, Lido, assignor to Okonite-Cable Co., Inc., Paterson, both in N. J.

2,300,735. **Threshold Plates Made of Waste Unvulcanized Fabric Material from Tire Trimmings, Reclaimed Rubber, Inert Filler, Asbestos, Rubber Accelerator, and a Volatile Solvent.** H. E. Spokes, Ann Arbor, Mich., assignor to American Brake Shoe & Foundry Co., New York, N. Y.

2,300,920. **Interpolymers of Vinyl Sulphonic Acid with Another Vinyl Compound and Aqueous Emulsions thereof.** W. Heuer, deceased, late of Hofheim in Taunus, Germany, by J. A. A. Heuer, administratrix, Hofheim in Taunus, assignor, by mesne assignments, to General Aniline & Film Corp., New York, N. Y.

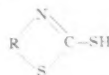
2,301,117. **Rubber Vulcanized in the Presence of an Accelerator Having the Formula R.C.H₂.S.C.(S)R, Where R Is a Naphthol Group and -S.C.(S)R Is a Dithio Acid Group.** A. F. Hardman, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,301,131. **Preparing Cyano Diolefines by Pyrolyzing an Acyloxy Propionitrile Containing a Halogen Alkyl Radical Having at Least Two Carbon Atoms to Split off a Carboxylic Acid and Hydrogen Halide.** J. G. Lichty, Stow, O., assignor to Wingfoot Corp., Wilmington, Del.

2,301,142. **Composition for Speeding up the Making of Pigment Pastes, Having Included therein a Xylo-Soluble Natural Rubber or Normally Solid Polyisobutylene, and a Non-Volatile Water-Insoluble Wetting Agent.** L. Room, South Orange, and A. Minich, East Orange, assignors to Nuodex Products Co., Inc., Elizabeth, all in N. J.

2,301,143. **Method of Increasing Production in Grinding Pigment Pastes Which Comprises Adding to the Pigment-Vehicle Mixture before Milling, a Solution of Xylo-Soluble Rubber Free from Wetting Agents.** L. Room, South Orange, and A. Minich, Roselle, assignors to Nuodex Products Co., Inc., Elizabeth, all in N. J.

2,301,149. **Preparation of a Vulcanization Accelerator Which Comprises Reacting Formaldehyde, a Salt of a Primary Aromatic Amine, and a Compound Having the Formula**



in Which R Is an Arylene Radical. W. Scott, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,301,222. **Stretched Rubber Hydrochloride Film Which Will Shrink When Heated to the Temperature at Which the Crystalline Structure Disappears When Examined under the X-Ray. But Which on Heating to a Lower Temperature above 70° C. Will Not Shrink.** H. D. Minich, Tarrytown, N. Y.

2,301,517. **Cyano-Isopropyl Ethers of Cyano-Alcohols.** H. A. Bruson, assignor to Resinous Products & Chemical Co., Philadelphia, Pa.

2,301,518. **9-Fluorene-β-Butyronitrile.** H. A. Bruson, assignor to Resinous Products & Chemical Co., both of Philadelphia, Pa.

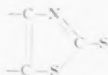
2,301,668. **Production of High Molecular Weight Substances by Condensation of Unsaturated Hydrocarbons Which Comprises Condensing, in the Presence of a Chlorinated Hydrocarbon, Olefin Hydrocarbons Together with Hydrocarbons Having More Than One Double Linkage and Hydrocarbons Containing at Least One Triple Linkage.** M. Pier, Heidelberg, and F. Christmann, Ludwigshafen-on-the-Rhine, Germany; vested in the Alien Property Custodian.

2,301,867. **Composition of Matter Comprising a Polyvinyl Halide and a Liquid Ester of 4-Cyclo-Hexene-1, 2-Dicarboxylic Acid.** T. L. Gresham, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,301,926. **Chlorination of Butadiene and Copolymers thereof in a Solvent Indifferent towards Chlorine and Subjecting the Synthetic Rubber after Polymerization to a Disaggregating Process by Exposing the Same to an Oxidizing**

Treatment in the Presence of Antioxidants until It Shows in Solution in Any Solvent in a Concentration of One Gram per 100 Ccms. of Solution a Relative Viscosity between 1.1 and 5. A. Blomer, Imbachi, near Opladen, and E. Konrad, Leverkusen I. G. Werk, Germany; vested in the Alien Property Custodian.

2,301,968. Process Which Comprises Vulcanizing Rubber in the Presence of Magnesium Oxide and an Accelerator Containing the Structure



wherein the Adjoining Carbon Atoms Do Not Constitute Part of Another Ring Structure. W. E. Phillips, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,301,971. N-Phenyl 2-Amino-Butadienes-1,3. W. Repp and O. Hecht, both of Ludwigshafen-on-the-Rhine, and E. Gassenmeier, Mannheim, both in Germany; vested in the Alien Property Custodian.

2,301,998. Soft Packing Gasket for Light-weight Stampings and Having a High Degree of Compressibility Composed of a Base of Asbestos and Wool Felt Fibers and a Binder of Polymerized Chloroprene Latex and Natural Rubber Latex. W. F. Bernstein, Brookfield, and V. J. Labrecque, assignors to Victor Misk & Gasket Co., both of Chicago, both in Ill.

2,302,361. Filler for Vinyl Resin Plastics. Comprising a Member of the Group Consisting of Iron and Zinc, the Particles of the Filler Carrying Enough Dried Alkaline Protective Coating to Prevent Deleterious Effect upon the Resin Due to the Presence of the Filler. V. Yavak, Lakewood, O., assignor to Carbide and Carbon Chemicals Corp., a corporation of N. Y.

2,302,378. Adhesive Composition Comprising an Aqueous Dispersion of Solution of Casein and Latex and Sodium 2,4,5-Trichlorophenate. R. T. Rasmussen, Merrick, N. Y.

2,302,384. Bactericide, Fungicide, and Insecticide Preparation Containing as an Active Constituent a Quinone Dioximino Compound. W. P. ter Horst, Packanack Lake, N. J., assignor to United States Rubber Co., New York, N. Y.

2,302,445. Polymerizing 2-Chloro-Butadiene-1,3. S. Kiesskalt, Frankfurt a.M., Höchst, W. Schleich, Bad Soden in Taunus, and H. Brunnotte and K. Winnacker, both of Frankfurt a.M., Höchst, all in Germany; vested in the Alien Property Custodian.

2,302,464. Hard, Colorless Resinous Product Consisting of a Copolymer of Para-Methyl-Alpha-Methyl-Styrene and a Styrene Having a Secondary Alpha Carbon Atom in the Side Chain. R. C. Palmer, C. H. Bibb, and W. T. McDuffee, Jr., assignors to Newport Industries, Inc., all of Pensacola, Fla.

2,302,557. Making Artificial Leather Products from Fabrics Having a Calendar Coat of Unvulcanized Rubber, by Applying a Thin Coat of Shellac over the Calendar Coat, Vulcanizing the Coat, Treating It with a Halogen-Hardening Agent, Neutralizing the Agent, and Applying over the Surface a Coating Comprising 2,2-Di-(4-Hydroxyphenyl)-Propane-Formaldehyde Resin Blended with Poly(methyl Acrylate, and Eaking the Resulting Product. C. M. Langhammer, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,302,583. Plastic Composition Comprising Chlorinated Rubber and a Plasticizer Consisting of Bis-Aryloxy-Alkyl Ether. R. S. Shurt, Columbus, O., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,302,833. Producing Porous Materials by Forming a Colloidal Solution of Silicic Acid, Mixing It with Rubber Latex Containing Sulphur and Ammonium Hydroxide in Amount Sufficient to Neutralize the Excess Acidity of the Colloidal Solution, the Admixture Resulting in the Formation of a Stiff Gel Characterized by Uniformity of Dispersion of the Silica Hydrogel in the Latex, Coagulating the Latex and Vulcanizing. A. S. Behrman, assignor to A. S. Behrman, trustee of Porous Rubber Products Trust, both of Chicago, Ill.

2,303,329 and 2,303,330. Treatment of Zinc Oxide to Form Zinc Propionate on the Surfaces of the Zinc Oxide Particles. H. M. (Sr.) Palmer, Pa., assignor to New Jersey Zinc Co., New York, N. Y.

2,303,593. Vulcanizing Rubber by Incorporating into a Rubber Mix, prior to Vulcanization, a Small Amount of a Salt of a Dimethylene Dithiocarbamic Acid Which Salt Is Devoid of Acidic Substituents. I. Williams, Borger, Tex., and B. M. Sturges, Pittman, N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,303,691. Unvulcanized Rubber of Increased Plasticity Obtained by Subjecting the Unvulcanized Rubber to the Action of a Compound Possessing the Structure



(Wherein R Represents an Aromatic Radical Free from Strongly Acidic or Basic Groups and Y Is Selected from a Group Consisting of Hydrogen and Acyl Radicals in the Absence of Sufficient Sulphur and Basic Material to Neutralize the Action of the Compound) to Effect a Marked Decrease in the Flow Resistance of the Rubber. M. W. Harman, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,303,708. Preserving Rubber by Treating It with a Product Obtained by Heating an Aliphatic Carboxylic Acid with a Condensation Product of a Ketone and a Secondary Aromatic Amine. R. L. Sibley, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

Dominion of Canada

408,222. Solid Synthetic Resinous Product Consisting Essentially of Polyvinyl Halide and an Oxide (Phenoxy Propene Oxide, Secondary Amyl Phenoxy Propene Oxide, or p-Tertiary Amyl Phenoxy Propene Oxide) and Possessing Elasticity and Thermal Stability. Canadian General Electric Co., Ltd., Toronto, Ont., assignee of R. C. Feagin, Schenectady, and J. G. E. Wright, Alplaus, co-inventors, both in N. Y., U. S. A.

408,223. Extrudable Insulating Composition for Wire Consisting of a Polyvinyl Halide Plasticized with an Ester (Dibenzyl Sebacate, Bis (Phenyl Propyl) Sebacate, or Bis (Phenyl Ethyl) Sebacate) and Possessing Good Tensile Strength, Cold Temperature Flexibility, and Low Loss of Plasticizer at Elevated Temperature. Canadian General Electric Co., Ltd., Toronto, Ont., assignee of J. J. Russell, Schenectady, N. Y., U. S. A.

408,271. Normally Flexible Plasticized Polyvinyl Alcohol Composition Containing Thermostabilizing Agent (Soluble Haloids of Ammonium, of Alkali Metals, and of Alkaline Earth Metals). Restolite Corp., Belleville, assignee of C. Daugelmayer, Natick, both in N. J., U. S. A.

408,296. Purified Rubber Prepared from Latex Dried in the Absence of Smoke at a Temperature of Less Than 50° C.; the Rubber Contains Less Than 0.05% Ash. Western Electric Co., Inc., New York, N. Y., assignee of A. R. Kemp, Westwood, N. J., and H. Peters, New York, co-inventors, both in the U. S. A.

408,306. Rubber Having Incorporated therein, as a Vulcanization Accelerator, a Small Amount of the 2-Mercapto-Benzo-Thiazole Salt of 2-Amino-5-Methyl-Thiazoline. Canadian Industries, Ltd., Montreal, P. Q., assignee of I. Williams, Borger, Tex., U. S. A.

408,367. Rubber Having Incorporated therein, as a Vulcanization Accelerator, a Small Amount of Diphenyl Carbamyl-2-Thiazolyl Sulphide. Canadian Industries, Ltd., Montreal, P. Q., assignee of I. Williams, Borger, Tex., U. S. A.

408,368. Rubber Having Incorporated therein a Small Proportion of a Combination of Primary and Secondary Accelerators in Which the Primary Accelerator Is 2-Mercapto-Thiazoline, and the Secondary Accelerator Is Di-Ortho-Tolyl Guanidine. Canadian Industries, Ltd., Montreal, P. Q., assignee of A. M. Neal, Wilmington, Del., and B. M. Sturges, Pittman, N. J., co-inventors, both in the U. S. A.

408,369. Organic Plastic Mold Lubricant Comprising Didodecyl Phosphate. Canadian Industries, Ltd., Montreal, P. Q., assignee of M. L. Macht, Arlington, N. J., U. S. A.

408,385. Processing Rubber by Subjecting the Compound to Penetrative Radiant Heat Rays of an Incandescent Electric Lamp. Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of J. E. Schott, Mishawaka, Ind., U. S. A.

408,428. Plastic Synthetic Rubber Composition Formed by Reacting Rubber with a Halogen Compound (Chlorosulfonic Acid) Followed by Hydrolysis to Split off and Remove the Halogen Compound, and a Linear Type Substantially Saturated Aliphatic Hydrocarbon Polymer (Hydrogenated Rubber or Polymerized Iso-olefin). Standard Oil Development Co., Linden, N. J., assignee of J. J. Wierzevich, whose name has been changed to P. J. Gaylor, Staten Island, N. Y., both in the U. S. A.

408,477. Rubber Having Incorporated therein a Diaryl Guanidine Activatable Sulphur-Containing Accelerator and the Complex Non-Hydroscopic Resin-Like Additive Product of Zinc Chloride and Di-Ortho-Tolyl Guanidine. American Cyanamid Co., New York, N. Y., assignee of A. R. Davis, Old Greenwich, Conn., both in the U. S. A.

408,542. Zinc Soap of Coconut Oil Acids in Combination with an Amine Capable of Rendering the Zinc Soap Soluble in Organic Solvents in Which the Zinc Soap Is Ordinarily Insoluble. Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. P. ter Horst, Packanack Lake, N. J., U. S. A.

408,588. Superior Hydrocarbon Copolymer Comprising a Rubber and about 5% to 80% of a Copolymer of an Iso-Olefin and of a Linearly Polymerizable Vinyl Compound (Styrene, Vinyl Halides, Vinyl Esters, Vinyl Ethers, Acrylic Compounds, Di-Olefins, Vinyl Acetylenes, or Arylene Oxides). Standard Oil Development Co., Linden, N. J., assignee of P. J. Gaylor, Staten Island, N. Y., co-inventors, both in the U. S. A.

408,697. Method Which Comprises Plasticizing Gamma Polyvinyl Chloride with a Tetrahydrofurfuryl Ester of a Carboxylic Acid. B. F. Goodrich Co., New York, N. Y., assignee of C. H. Alexander, Cuyahoga Falls, O., both in the U. S. A.

408,751. Reclaiming of Vulcanized Rubber by Introducing Vulcanized Rubber Scrap into a Liquid Bath of Bituminous Material, Heating to a Uniform Temperature within the Range of about 180 to 225° C. and Continuing the Heating for from about 30 to 60 Minutes, whereby the Rubber Does Not Swell or Dissolve Substantially and Can be Readily Plasticized. Rubber & Plastics Compound Co., Inc., New York, N. Y., U. S. A., assignee of H. and O. Ghez, co-inventors, both of Paris, France.

408,753. Process of Manufacturing Tapes, Sheets, Etc. of Electrical Insulating Material Which Comprises Impregnating the Tapes of Fibrous Material with Styrene or Styrene Mixture (Comprising Approximately 60% Styrene and 40% Chlorinated Diphenyl). Converting the Styrene into Polystyrene at an Elevated Temperature While the Fibrous Material Is Immersed in a Bath of Liquid Styrene or Styrene Mixture whereby Loss of Styrene by Volatilization during Polymerization Is Inhibited. Northern Electric Co., Ltd., Montreal, P. Q., assignee of J. K. Webb, London, England.

408,889. Metal Article With Surface Provided with a Single Baked-on Polarity-Stratified Coating in Which the Essential Film-Forming Material Is a Copolymer of Vinyl Chloride and Vinyl Acetate, and the Material of More Intense Polarity That Underlies the First-Named Material Is a Resinoid (Non-Oil-Modified Alkaline Condensed, Bi-Functional, Lower-Alkyl- and Aryl-Substituted Phenol Aldehyde Resinoids). Stoner-Mudge, Inc., Pittsburgh, assignee of F. R. Stoner, Jr., Edgeworth, and D. McCabe Gray, Sewickley, co-inventors, all in Pa., U. S. A.

United Kingdom

548,486. Chlorination of Polyvinyl Chloride. J. Chapman, J. W. C. Crawford, and Imperial Chemical Industries, Ltd.

548,524. Concentrated Rubber Latex. Aktiebolaget Separator.

548,726. Treating Natural Aqueous Dispersions of Rubber and Like Vegetable Resins. Revertex, Ltd. (I. Kemp).

MACHINERY

United States

2,300,808. Knitting Machine with Device to Feed Elastic Yarn to the Knitting Cylinder. N. B. Reed, assignor to Surgical Products, Inc., both of Lowell, Mass.

2,301,251. X-Ray Apparatus for Tire Inspection. W. H. Capen, Mountain Lakes, N. J., assignor to International Standard Electric Corp., New York, N. Y.

2,301,338. Apparatus to Form Lengths of Tubular Stock. H. T. Smith, St. Clair Shores, Mich., assignor to United States Rubber Co., New York, N. Y.

2,301,958. Tire Balancer. J. P. Lannen, Detroit, Mich.

2,302,094. Mold for Molding Pickers. H. M. Bacon, assignor to Dayton Rubber Mfg. Co., both of Dayton, O.

2,302,099. Tire Tube Tester. E. N. Bittner, Wading River, N. Y.

2,302,133. Mold for Retreading and/or Recapping Tires. W. V. Maze, assignor to C. E. Miller Mfg. Corp., both of Anderson, Ind.

2,302,543. Apparatus and Process for Covering Elastic Filaments. R. A. Gift, Jr., and R. F. Jessen, Trenton, N. J., assignors to Filatex Corp., New York, N. Y.

2,302,754. Tire Vulcanizing Apparatus. W. D. Eakin, Hudson, O.

2,303,198. Vulcanization Apparatus for Decorating Trim Panels. G. R. Cunningham, Grosse Pointe Park, Mich., assignor to National Automotive Fibres, Inc., Detroit, both in Mich.

2,303,341. Apparatus and Method for Heating and Vulcanizing Rubber, Etc. R. Dufour, Paris, and H. A. Leduc, Asnières, both in Seine, France.

2,303,554. Vulcanizer. M. W. Humphreys, Euclid, assignor to Ohio Rubber Co., Willoughby, both in O.

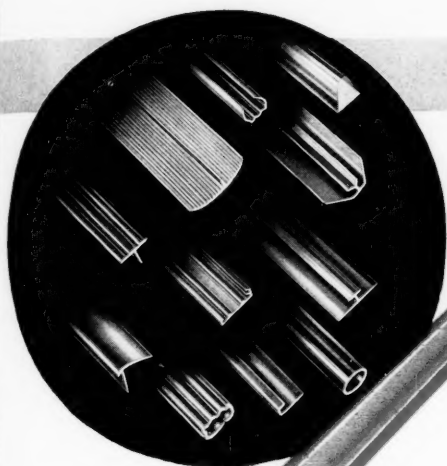
UNCLASSIFIED

United States

2,301,096. Valve Adapted to Be Positioned between the Inner and Outer Chambers in a
(Continued on page 422)

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LATIN AMERICA

BRAZIL

Labor a Rubber Industry Problem

In discussing with the press the question of Brazilian outputs of rubber, Joao Alberto Lins de Barros, co-ordinator of economic mobilization, was careful to emphasize that here the most important factor was an adequate supply of trained workers. He pointed out that the great rubber areas in the hinterland of the Amazon territory are thinly populated, and it would be a difficult problem to bring enough workers to these wild and almost inaccessible regions. But though difficult, the task is not impossible; so he has undertaken the stupendous job of moving 78,000 workers to the interior. Because of lack of shipping and other transportation facilities, the men will have to travel on foot, passing over mountains, rivers, jungles, and swamps, for more than 600 miles, but it is expected that they will be able to cover 20 miles a day. It is planned to send out 2,000 men weekly, and later on, when all have been settled, wives and families will be sent for. Facilities for resting, for food and medical care, have been provided at various points along the way.

Other agencies, which began operations in April, 1942, succeeded in sending 13,088 workers to the Amazon Valley in seven months.

Rubber Credit Bank Controls Rubber

By a decree-law dated October 17, 1942, and effective October 20, 1942, the Bank of Brazil, which earlier in the year had been designated sole buyer and seller of Brazilian rubber, is to hand over this function to the recently established Rubber Credit Bank, which now has full control over the rubber program. It will have power to intervene in such plantations which are either not exploited at all or are mismanaged; it will supervise the actual operation of all those connected with the gathering of rubber, and in this connection will have the advice of the Brazilian Departments of Labor, Industry and Commerce and of Agriculture; relations between owners of plantations, concessionaires and rubber tappers will be governed by standard contracts approved by the Rubber Credit Bank.

It is expected that the new powers of the Rubber Credit Bank will be especially helpful to the efforts being made to encourage emigration of labor forces to the rubber lands in the interior since the new contracts have various provisions calculated to satisfy labor already on the job and to attract new laborers, since they apply to both categories alike. Thus the tapper is to receive 60% of the interior selling price for rubber; the operator who directs the work of the tapper gets 33%, and the owner of the land gets the remaining 7%. The tapper is granted one hectare of land near his home for subsistence farming and is also allowed one-half of all the Brazil nuts he may gather and finally has rights to the animal skins he may hunt.

Rubber trees and Brazil nut trees may not be cut down without the specific authorization of the Instituto Agronomico do Norte.

MEXICO

Ceiling price of 4.15 pesos per kilogram (39 cents per pound) has been fixed for washed, coagulated, and sheet rubber at the points of concentration of the production zones of the country by a presidential decree. This rate is to serve as a base for differential prices for each of these concentration centers, less the costs of freight and other transportation services from them to the city. The ceiling price is in effect for an indefinite period, probably for the duration.

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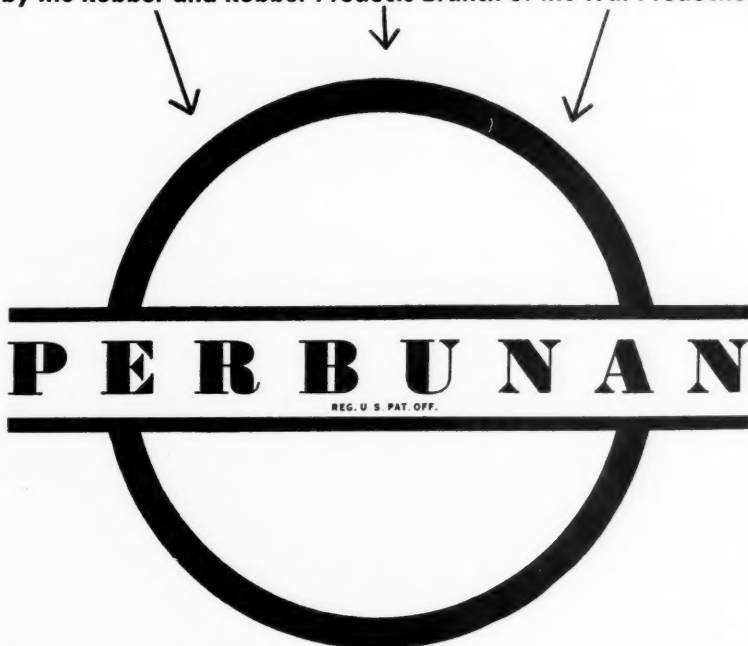
②

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COLOMBIA

The rubber agreement between the Caja de Credito and the Rubber Reserve Co. was an event of great importance here too. As yet only small amounts of rubber have been coming out, but outputs are expected to increase. Since the country has been suffering to some extent from unemployment, the question of manpower should offer no insuperable difficulties. To facilitate shipping of rubber, landing fields are being developed, and recently the Calamar Airport was opened on the upper Vaupes River in the Vaupes Comisaria.

A factor that may prove an obstacle to rubber producing efforts is the serious shortage of tires which has already led to the withdrawal of 30 to 40% of commercial motor vehicles, thus greatly complicating transportation problems. Colombia needs at least 200,000 tires a year; so far she has been able to receive only a small fraction of these requirements. Brazil is said to have sent about 20,000 tires, and an additional 10,000 tires will come from the United States, which will relieve the situation to some extent. In view of the grave condition, the local press is strongly urging the establishment of a tire factory here.

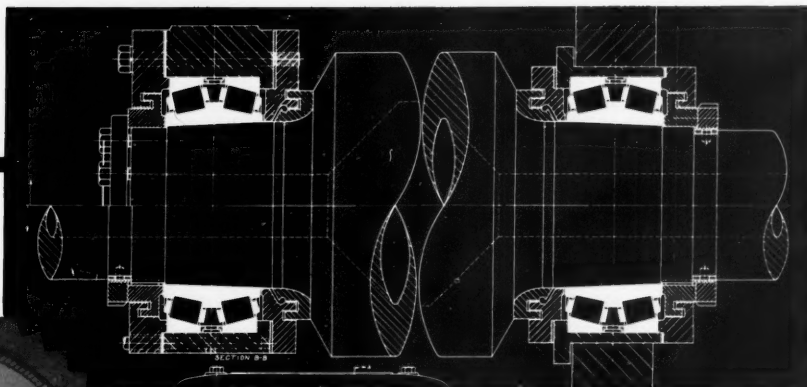
ECUADOR

The price received by rubber exporters in Ecuador prior to the signing of the rubber agreement was higher than that specified in the agreement; consequently pessimists prophesied a sharp drop in outputs. That the price is fair and allows the operator an adequate profit is proved by the fact that production and exportation in August, the month following the agreement, continued to be normal, and late reports indicate that abundant supplies of rubber continue to reach Guayaquil. Further proof that the price is adequate is furnished by the complaint of agriculturists that the attractive wages that rubber operators are able to offer is drawing away farm labor.

Ecuador is another country that depends on imports for its supply of tires and tubes, and here too a shortage exists. The United States has agreed to allocate a certain number of tires and tubes as well as other rubber goods. Additional tires and tubes have been received from Argentina, which had an arrangement with Ecuador whereby a certain portion of the raw rubber shipped by Ecuador to Argentina would be re-exported to Ecuador in the form of tires and tubes. The tire shortage, by forcing the reduction of the number of motor vehicles in circulation, has also reacted on the gasoline industry here; it curtailed the local production of residue petroleum, a by-product of gasoline production, so that railroads and other requirements can no longer be satisfied.

COSTA RICA

The efforts of the Americas to develop Western Hemisphere resources of rubber and also of other products formerly imported from the Far East as drugs, vegetable oils, fibers, and certain foods will be greatly assisted by the modern scientific agricultural research to be carried out by the Inter-American Institute of Agricultural Sciences to be established at Costa Rica. The new Institute will function as an aid to continental research and agricultural experiment stations and will help in the training of scientific personnel. The governing board of the Pan-American Union has named Earl N. Bressman, an authority on inter-American agriculture, as director of the Institute, and Jose L. Colem, chief of the Division of Agricultural Cooperation of the Pan-American Union, has been appointed secretary.



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EUROPE GREAT BRITAIN

Federation of British Rubber & Allied Manufacturers

The following associations are members of the Federation of British Rubber, Allied Manufacturers' Associations: Association of British Ebonite Manufacturers, British Rubber Adhesive Manufacturers' Association, British All-Rubber Hose Manufacturers' Association, British Association of Balata Belting Manufacturers, British Rubber Belting Manufacturers' Association, British Cellular Rubber Manufacturers' Association, British Rubber Flooring Manufacturers' Association, Food Jar Rings Association, Football Bladder Association, British Rubber Hot Water Bottle Manufacturers' Association, British Latex Manufacturers' Association, British Rubber Mechanical Association, Rubber Proofer's Association, British Molded Rubber Hose Manufacturers' Association, Association of British Reclaimed Rubber Manufacturers, Retread Manufacturers' Association, Screw Stopper Makers' Association, British Rubber Shoe Manufacturers' Association of Great Britain, British Rubber Sport Goods Association, Rubber Sole & Heel Manufacturers' Association, Surgical Rubber Manufacturers' Association, Tire Manufacturers' Conference, English India Rubber Thread Association, and British Wrapped Rubber Hose Manufacturers' Association.

Members of the Federation of British Rubber & Allied Manufacturers' Association get 96% of rubber allocation by the Rubber Control. The Federation has requested a formal meeting with the Board of Trade to state the case for non-concentration of the rubber industry.

Chemical Reactions of Latex During Vulcanization

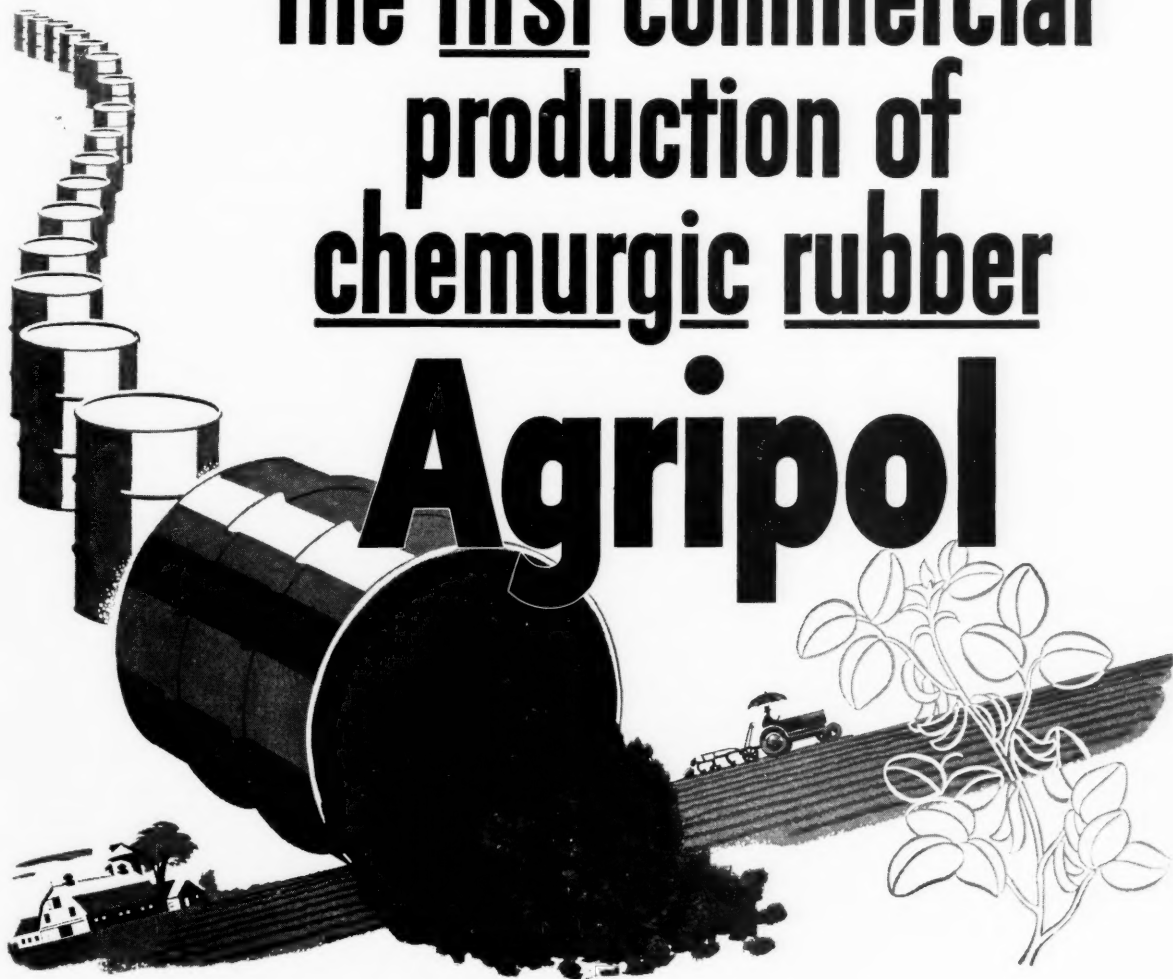
In "Liquid Rubber Latex", Part IV of "Chemical Reactions during Vulcanization", E. A. Hauser, D. S. le Beau, and J. Y. Kao attempt to clear up some unsolved questions regarding vulcanized latex films. They point out that the formation of coherent films from unvulcanized latex by drying or coagulation can be explained as a gluing together of the individual particles due to the characteristic tackiness of the uncured hydrocarbon. But since vulcanized rubber loses this tackiness, it is hard to understand how films can be deposited by vulcanized latex, and still more incomprehensible why these films have outstanding mechanical properties. The authors examined the effect of preheating, proportion of sulphur, time, and temperature on the vulcanization of liquid latex and also the mechanical and chemical properties of freshly coagulated films.

For their experiments they used the following basic formula, except where otherwise stated:

100 parts rubber (as 60% concentrated latex), 2 parts ZnO (activator), 2 parts S, 0.5-part Butyl zimate (accelerator), 0.5-part casein (stabilizer), 0.5-part NaOH (stabilizer). After the addition of sulphur and ZnO, preheating was carried out for 30 minutes at 80° C. A blank run showed that no vulcanization took place under these conditions at temperatures below 100° C. Next accelerator was added, and the cure completed (the standard curing temperature was 80° C.), and the resulting product tested to determine the effect of preheating. It was found that tensile and elongation are practically independent of the time of preheating, but sulphur combination increases markedly with the preheating time. Again the combined sulphur in the dried sheet not only remained practically constant, but was less than that found in the liquid latex. Preheating, it is thought, immobilizes part of the sulphur in the interior of the particle, but this sulphur cannot be reached by the accelerator, hence takes no part in the subsequent actual cure.

It was further found that the amount of sulphur in the compound has no effect on the amount of combination, but that the time and the temperature of vulcanization do exercise very great influence. However, when the sulphur content in a compound is high and a great excess of accelerator is added, there is a consid-

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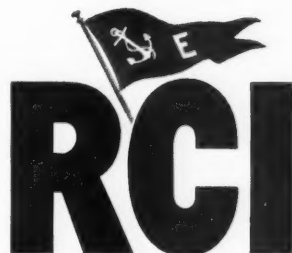
which involve complex chemistry, was among the first to undertake making chemurgic rubber a practical manufacturing accomplishment . . . thus carrying the notable work of the laboratory* to its ultimate goal.

The speed and success of this endeavor are now evident . . . Agripol is available commercially, offering its contribution to the solution of our Nation's wartime rubber problem.

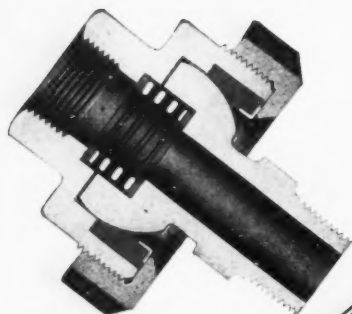
*RCI gives credit to the Northern Regional Research Laboratories, U. S. Department of Agriculture, Peoria, Illinois for their original research work on the utilization of farm products in industry, and to their technical staff for their cooperation on this development.

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erable increase in combination. It was also observed that while an increase in time of cure and of temperature does not militate against the prolonged retention of the tensile plateau, increasing amounts of sulphur and particularly of accelerator lead to pronounced tensile maxima.

To study the chemical and mechanical properties of freshly coagulated films, latex was coagulated to a film on a layer of acetic acid-collodion and then dehydrated under standard conditions by immersion in alcohol. Tests showed that tensile and elongation decrease drastically with increasing amounts of accelerator in the cure or with increasing combined sulphur. This, in connection with the high tensiles of dried vulcanized latex films, suggests that some structural change must take place during drying. As in a measure confirming their view, the writers cite the fact that in comparative tests the drying rate of uncured rubber was found to become constant after a certain limited time; whereas the drying rate of cured rubber films showed a pronounced drop after a specific period of time.

Dr. Schidrowitz, who reviewed this material in his "Views and Reviews", in *India Rubber Journal*, points out that the vulcanizates of the base compound mentioned above consistently gave tensile strengths of 4,000 to 5,000 pounds per square inch and that the maximum tensiles always corresponded to a combined sulphur of about 0.4-gram per 100 grams of rubber. These figures, he adds, agree very well with observations made by him many years ago in the course of much (unpublished) work on Vultex.

Britain Tests Russian Dandelion

Britain is experimenting with the Russian variety of dandelion that yields *kok-sagyz rubber*. The Ministry of Supply has obtained some seed which is being tried out in 20 experimental stations from Scotland to the south of England. Some of the plants are said to be already growing at Kew Gardens. Seed has also been sent to Australia, Canada, New Zealand, and India.

FRANCE

In view of the tremendously increased importance that the plastics have now assumed, news of the developments in other countries, particularly those now occupied by or under the influence of Germany, deserves special attention. Late reports on the synthetics industry in France are not obtainable, but a review of some of the manufacturers and the products put out up to the time of the outbreak of the war should be useful, especially as France produced important amounts of different materials. This production was sufficiently large, largely because of the abundance of raw materials for various purposes, to permit of a substantial export business.

France had no synthetic rubber industry, but chlorinated rubber was manufactured by two concerns, Alais, Froges et Camargue, Lyon-Pechiney (known also as the only French manufacturer of urea), which called its product Protex; and the S.A.d'Electro-Chimie et d'Electro-Metallurgie d'Ugine, Paris, which put out "Electrogum."

The polyvinyl resins were made principally of acetylene derivatives, and the suppliers were: Soc. des Usines Rhone-Poulenc, Paris, the largest producer of this material. Its products included: polyvinyl acetates, sold as Rhodopas and Rhovinal; polyvinyl alcohols, under the name of Rhodoviol; polyvinyl-X chlorides under the name of Rhodopas X; and polystyrols, as Rhodolene.

Etablissements Kuhlmann, Paris, the largest chemical concern in France at the time, manufactured polyvinyl acetate resins under the trade name Resovyls.

H.G.D. (S.A. Huiles, Goudrons et Derives, Paris) sold vinyl polymers as Gedovyle, and styrol derivatives, as Gedolene.

Nobel Francaise made Novyls, which were polyvinyl acetates; Revyls, condensation resins; and Alvylys, polyvinyl alcohols.

Resines et Vernis Artificiels, Paris (R.V.A.), marketed vinyl acetates under the name Ervinyl, vinyl acetate emulsions as Ervosols, and vinyl chlorides as Plastogil.

Glyptal resins were the specialties of two firms, Kuhlmann and R.V.A. The raw materials for these plastics were chiefly glycerine obtained from the soap factories in southern France, and the phthalic acid anhydride produced by Kuhlmann and Saint-Gobain from naphthalin, or that obtained by H.G.D. in connection with the distillation of tar.

Kuhlmann manufactured pure glycerine phthalic acid resins known as Glycopal; oil phthalic acid resins, as Durecols NH, abietin phthalic acid resins, Durecols NA; and oil abietin phthalic acid resins, Glycodienes.

R.V.A. offered glycerine phthalic acid resins as Alitalates, and malein colophonium resins as Alresates.

The chief firms producing aminoplasts were:

Kuhlmann, which made molding powders, known as Poudre Pollopas; impregnation lacquers, as Pollopas S; resins as Plastopal, and lacs, as Aminolacs, from urea formaldehyde, in addition to formaldehyde molding powders known as Poudre Formanil.

Soc. Nobel Française, manufacturer of Prystaline, urea formaldehyde molding powder.

R.V.A., which put out urea formaldehyde molding powders Uralise.

Clear, semi-transparent and colored cumarone resins were made by the large tar-distillation firm known as H.G.D.

Oil-soluble phenoplasts were produced by four firms, H.G.D., Kuhlmann, Soc. Nobel Française, and the R.V.A.

Other phenoplasts were produced on a comparatively large scale by at least 15 different firms, the most important of which were:

S.A. la Bakelite, at the Bezons factory (Seine-et-Oise), trade mark, Bakecite; La Fibre Diamond, La Plaine-Saint-Denis (Seine), Celoron, Dilecto, and Vulcoid; H.G.D., trade name, Gidelite; R.V.A., trade name, Progolite; Soc. Generale de Constructions Electriques et Mecaniques, Alsthom, Paris, trade names, Textolite and Cellopas.

According to a French order of July 4, 1942, African exportation and production of rubber are to be under control of an Office for the Distribution and Conditioning of Rubber, with headquarters in Paris, assisted by agencies and representations in French Africa. The Office has to guarantee the exportation of all rubber produced in French Africa for the duration of the purchase agreements made between the Organization Committee of Producers of Rubber, Gums, and Resins, and the Association of Rubber Importers. Producers and holders of rubber have been ordered to place all their rubber at the disposition of this Office, which must receive and store the rubber; for this work it collects a fee of one franc per kilogram received, which is used to defray expenses.

Some months before this, an Inter-Trade Rubber Committee was established to act as a parity coordination committee to study problems of common interest to colonial rubber producers and French manufacturing industries.

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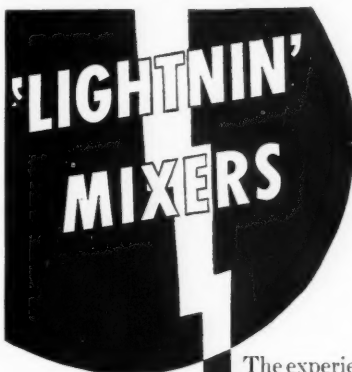
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Editors' Book Table

NEW PUBLICATIONS

"Koroseal Handbook of Technical Information." The B. F. Goodrich Co., Akron, O. Section I—General. 24 pages. This publication is indicated as the first of a series to be issued as a technical service to keep the industry informed as to the physical, chemical, electrical and processing characteristics of Koroseal compounds and to aid in their use. Section II is to cover Koroseal insulating and jacketing materials for the wire and cable industry; Section III will describe in detail the tests used to evaluate thermoplastic and thermosetting materials, and later sections will cover additional subjects of major importance.

This first section is comprehensive in its coverage of the chemistry and physical properties of this plasticized polymerized polyvinyl chloride resin and includes a table of physical constants in which some of the properties, as tearing strength, flexibility, impact strength, and abrasion resistance, are compared qualitatively with natural rubber compounds. This discussion on plasticizers shows by means of charts how the physical and electrical properties of the polymer may be varied by the addition of these materials. The compounding of Koroseal with materials ranging from wood flour through carbon blacks to silica and mica is also illustrated by means of charts.

Mention is made of the addition of certain thermosetting polymers to Koroseal to produce finished products capable of being vulcanized. It is indicated that additional data on this type of material will be furnished in subsequent sections to be published later.

Some uses of Koroseal, as in protective coatings, in many electrical applications, and for many types of mechanical goods items including molded articles, are described. The details of the mixing of Koroseal compounds both on the open mill and in the Banbury are covered as are the other processing methods such as extrusion, calendaring, and molding in a description of the manufacturing of finished products from this material. Brief mention is made of Koroseal solutions and gels in concluding this first section of the handbook.

"Enlisted for the Victory." Bibb Mfg. Co., Macon, Ga. 24 pages. The contribution of this company's many types of cotton yarns, cords, and fabrics to the war effort is described in a very interesting manner in this colorfully illustrated booklet. A foreword by W. D. Anderson, chairman of the board of directors, expresses the pledge of all Bibb workers to do their utmost on the production for the duration. The use of Bibb yarns, cord and twine for the manufacture of camouflage nets, parachute shrouds, insulated wire, and webbing for many purposes is graphically explained. Rubberized canvas boats, portable airplane hangars, and targets for training fighter pilots, all made from fabrics manufactured by Bibb, are other products mentioned in this same manner.

"Vinylite Plastics for Wire and Cable Insulation." Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York, N. Y. 12 pages. The purpose of this new booklet is to review for electric wire and cable users the important advantages that derive from the use of Vinylite resin compounds for wire and cable insulation from the standpoints of installation, service, and safety. After explaining in a general way the problems of wire and cable insulation and the processing of the resin for this work there are listed in some detail the practical advantages, characteristics, typical applications, and specific advantages where Vinylite resin compounds have been or may be used.

"Fend." Mine Safety Appliances Co., Pittsburgh, Pa. Bulletin FA-79. 16 pages. Each of the six different types of Fend creams and lotions formulated to provide protection against specific skin hazards in industry are described in this booklet. These types are the result of intensive research into problems of industrial dermatitis and are declared to mark a definite advance in modern skin protection. An application chart gives a partial list of chemicals and processes for which these products afford protection.

"The Interaction between Rubber and Liquids. II. The Thermodynamical Basis of the Swelling and Solution of Rubber." G. Gee. Publication No. 25. British Rubber Producers' Research Association, 19 Fenchurch St., London, E.C. 3, England. 8 pages. The purpose of this paper is to show that the general phenomena of solubility and swelling of rubber could be understood on the basis of detailed results found experimentally for the rubber-benzene system. Using no arbitrary constants which could not be related to experiment, temperature coefficients of solubility of the right order of magnitude were calculated. It is made clear that the qualitative agreement of this treatment with the meager experimental data at present available must not be taken as evidence of the accuracy in detail of the equations employed for the heat and entropy of solution.

"Haydenite." The Stanley Chemical Co., East Berlin, Conn. 16 pages. A description of some of the events leading up to the development of special formulations for coating of raincoat fabrics using polyvinyl butyral as a base material is outlined in this booklet. The use of this company's base coat and finish coat compounds for manufacture of fabrics coated on one side and finished without a curing operation is described in some detail. The production of fabrics coated on both sides by means of other special compounds is also covered together with some discussion of the difference in properties between fabrics coated on one or two sides. Haydenite cements and cementing methods for use with Haydenite coated fabrics of both types completes the description of production techniques. Development work on thermosetting types of Haydenite is mentioned, and it is indicated that these types will be available shortly and that it is expected that they will have improved properties to add to the generally satisfactory performance of the thermoplastic types.

"Controlled Materials Plan. General Instructions on Bills of Materials." War Production Board, Washington, D. C. 48 pages. **"Tire Dealers' Guide to Price Regulations."** Retailers' Bulletin No. 8, Office of Price Administration, Washington, D. C. 8 pages. **"Retreaded and Recapped Tires and Retreading and Recapping of Rubber Tires."** Retailers' Bulletin No. 6, OPA. 8 pages. **"Rubber from Guayule."** United States Department of Agriculture, Washington, D. C. 7 pages. **"Barite, Witherite, and Barium Chemicals."** B. L. Johnson and K. G. Warner, U. S. Department of the Interior, Bureau of Mines, Washington, D. C. 16 pages. **"Saran—Chemically Resistant Plastic Tubings and Fittings."** Bulletin No. P-1, Hodgman Rubber Co., Framingham, Mass. 4 pages. **"The Porter-Lipp Strain Gage."** 4 pages; No. 169. **"SR-4 Portable Strain Indicator."** 4 pages; No. 170. **"SR-4 Strain Recorder."** 4 pages. **"Survey of American Listed Corporations, Report No. 3. Tires & Other Rubber Products."** Securities and Exchange Commission, Washington, D. C. 74 pages. **"Robertson Reminders."** Vol. 10, No. 4. John Robertson Co., Inc., 121-135 Water St., Brooklyn, N. Y. 16 pages.

RUBBER BIBLIOGRAPHY

RUBBER IN SOUTH AFRICA. *India-Rubber J.*, Nov. 7, 1942, p. 3. SYNTHETIC RUBBERS NOMENCLATURE. Part II. H. Barron, *Rubber Age (London)*, Nov., 1942, pp. 207-208.

IMPORTANCE OF ACIDIC CONSTITUENTS IN COMPOUNDING AMMONIA-PRESERVED LATEX WITH ZINC OXIDE. W. G. Wren, *Trans. Inst. Rubber Ind.*, Oct., 1942, pp. 91-114.

DISTRIBUTION OF NON-RUBBER SUBSTANCES IN PRESERVED LATEX. Part II. H. C. Baker, *Trans. Inst. Rubber Ind.*, Oct., 1942, pp. 115-30.

DISCUSSION ON PROBLEMS ARISING FROM THE RESTRICTION IN RAW RUBBER SUPPLIES. *Trans. Inst. Rubber Ind.*, Oct., 1942, pp. 131-36.

RUBBER FORMULATION BASED ON BULKING VALUES. F. N. Upham, *Trans. Inst. Rubber Ind.*, Oct., 1942, pp. 137-40.

THE STRANGE CASE OF RUBBER AND FUEL. W. N. Small, *Domestic Commerce*, Dec. 10, 1942, pp. 7-8.

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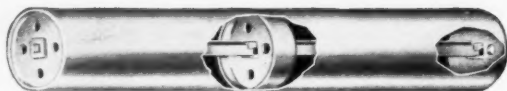
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RUBBER, POLYISOPRENES, AND ALLIED COMPOUNDS. I. E. H. Farmer and D. A. Sutton, *Rubber Chem. Tech.*, Oct., 1942, pp. 798-805.

STATISTICAL THERMODYNAMICS OF RUBBER. II. F. T. Wall, *Rubber Chem. Tech.*, Oct., 1942, pp. 806-11.

CONSTITUTION OF THREE-DIMENSIONAL POLYMERS AND THE THEORY OF GELATION. P. J. Flory, *Rubber Chem. Tech.*, Oct., 1942, pp. 812-19.

THE EFFECT OF TEMPERATURE AND SOLVENT TYPE ON THE INTRINSIC VISCOSITY OF HIGH-POLYMER SOLUTIONS. T. Alfrey, A. Bartovics, and H. Mark, *Rubber Chem. Tech.*, Oct., 1942, pp. 820-25.

THE PLASTIC-ELASTIC BEHAVIOR OF EBONITE. J. R. Scott, *Rubber Chem. Tech.*, Oct., 1942, pp. 826-34.

RUBBER PHOTOGELS. W. J. S. Naughton, *Rubber Chem. Tech.*, Oct., 1942, pp. 835-42.

THE CAOUTCHOOL COMPONENT OF NATURAL RUBBER. A Correction. K. C. Roberts, *Rubber Chem. Tech.*, Oct., 1942, pp. 843-46.

THE STRUCTURE OF POLYCHLOROPRENE. C. J. B. Clews, *Rubber Chem. Tech.*, Oct., 1942, pp. 847-53.

PHYSICAL-CHEMICAL INVESTIGATION OF ARTIFICIAL RUBBER. A. Springer, *Rubber Chem. Tech.*, Oct., 1942, pp. 854-59.

RUBBER IN VIBRATION. S. D. Gehman, *Rubber Chem. Tech.*, Oct., 1942, pp. 860-73.

DIELECTRIC CONSTANT, POWER FACTOR, AND CONDUCTIVITY OF THE SYSTEM RUBBER-CALCIUM CARBONATE. A. H. Scott and A. T. McPherson, *Rubber Chem. Tech.*, Oct., 1942, pp. 879-94.

ANALYTICAL METHODS IN RUBBER CHEMISTRY. V. F. Hilton, *Rubber Chem. Tech.*, Oct., 1942, pp. 965-77.

RUBBER ANALYSIS OF PLANTS IN SOUTH CAROLINA. J. H. Mitchell, M. A. Rice, and D. B. Roderick, *Rubber Chem. Tech.*, Oct., 1942, pp. 978-79.

PRODUCTION OF COATED FABRICS. J. B. Cleaveland, *Textile World*, Dec., 1942, pp. 76-77.

COTTON TIRE CORD TERMS. *Textile World*, Dec., 1942, p. 95.

THE McGAY TUBELESS TIRE. *Automotive & Aviation Ind.*, Dec. 15, 1942, p. 47.

AUTOMATIC LEVELING BULB LIFTER FOR BUTADIENE ANALYSIS. W. R. Atwater, *Ind. Eng. Chem.*, Dec., 1942, p. 954.

LOW-TEMPERATURE FLEXING APPARATUS. S. M. Martin, Jr., *Rubber Age (N. Y.)*, Dec., 1942, pp. 227-28.

NULLIFYING STATIC ELECTRICITY IN RUGS AND CARPETS. *Rubber Age (N. Y.)*, Dec., 1942, p. 228.

THE ROLE OF SOAP IN THE RUBBER PROGRAM. G. Leffingwell and N. Radin, *Rubber Age (N. Y.)*, Dec., 1942, pp. 235-36.

ABSTRACTS OF UNITED STATES PATENTS ON THE COMPOUNDING AND USE OF SYNTHETIC RUBBER. V. F. Marchionna, *Rubber Age (N. Y.)*, Dec., 1942, pp. 237-39 (To be continued).

THE SYNTHETIC PROGRAM. *Ind. Eng. Chem.*, Nov., 1942, pp. 1256-59.

PROGRESS OF BUTADIENE PRODUCTION. A. L. Elder, *Ind. Eng. Chem.*, Nov., 1942, pp. 1260-66.

PROGRESS OF STYRENE PRODUCTION. W. Dow, *Ind. Eng. Chem.*, Nov., 1942, pp. 1267-68.

ACTION OF ORGANIC ACCELERATORS IN BUNA S. G. R. Vila, *Ind. Eng. Chem.*, Nov., 1942, pp. 1269-76.

Role of Zinc Oxide

(Continued from page 368)

$$\text{R.p.m. around axle} = \frac{35 \times 5280}{60 \times 2.3 \times \pi} = 426$$

Peripheral speed = 35 m.p.h. on outer circumference of tire
Horizontal speed = 35 m.p.h., equivalent to 35 m.p.h. wind, neglecting wing drag which will vary with tread design, etc.

(b) Laboratory Flexometer Test

R.p.m. = 875

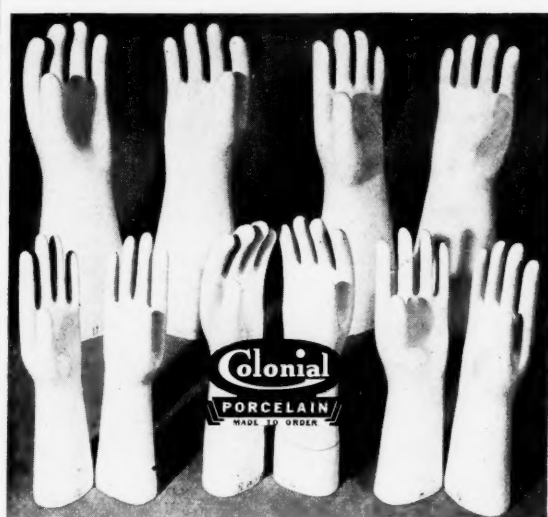
$$\text{Peripheral speed of outer circumference of test specimen} = \frac{875 \times \pi \times 1.5 \times 60}{12 \times 5280} = 3.9 \text{ m.p.h.}$$

(Note that peripheral speed of laboratory test specimen is only one-ninth that of tire in service.)

RMP ANTIMONY FOR RED RUBBER

.... The utmost in
pleasing appearance
with no deteriorating
effect whatever.

RARE METAL PRODUCTS CO.
BELLEVILLE, N. J.



Porcelain Glove Forms

—for dipped rubber gloves, including linemen's or electricians' gloves and surgeons' gloves. Some are made from our own stock molds and others from customers' molds.

Write today for our new catalog covering rubber glove and other forms for dipped rubber goods. Prompt attention given to requests for quotations based on your specifications or stock items.

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Akron, Ohio, U. S. A.

Exact Weight Scales

for Scrap, Crude, Synthetic Rubbers . . .

Ingredient compounding may be done from scrap, crude or synthetic bases but from whatever base fraction-ounce weighing is more vital today than at any time in our history as an industrial nation. Rubber aplenty is one of our *have nots*, so weigh and measure what you have with care. EXACT WEIGHT Scales in the rubber industry have never been in greater use and more are being bought. Are you protecting and weighing accurately your working stock?



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EXACT WEIGHT Scale Model 8006 for rubber goods compounding. Capacity to 22 lbs. Accurate to 1/8 oz.

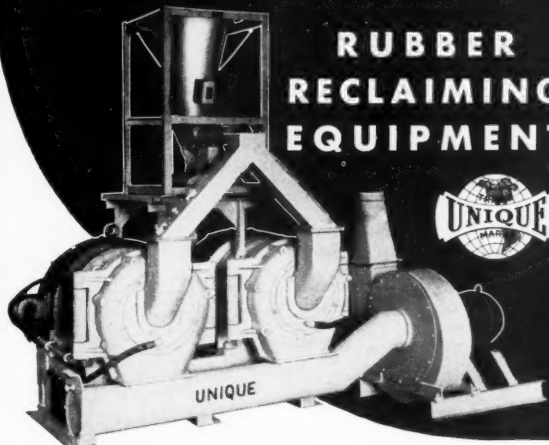
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THERE IS NO SUBSTITUTE FOR EXACT WEIGHT
**INDUSTRIAL
PRECISION SCALES**

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RUBBER RECLAIMING EQUIPMENT



This pair of "Frigidisc" Grinders is equipped with special vibrating feeder. The mills discharge into a suction pipe connected with a steel fan . . . thence to a products collector (not shown). Designed to reduce precut rubber scrap into a fine, uniform product. Let our engineers help solve your processing problem.

ROBINSON MANUFACTURING COMPANY
30 CHURCH STREET, NEW YORK • Works: Muncy, Pa.

Market Reviews

RECLAIMED RUBBER

DEMAND for reclaimed rubber remains at a good level as reported last month, and production has also continued at about the same rate. Postponement of the higher ceiling prices for scrap rubber until April, at the request of the Rubber Director, should enable reclaimers to adjust themselves to changed operating conditions expected to result from reduction in the number of grades of reclaimed rubber that are to be manufactured. Good stocks of reclaim are on hand or are being produced to take care of the demand. Ceiling prices on selected grades are listed below:

Ceiling Prices

Auto Tire	Sp. Grav.	¢ per lb.
Black Select.....	1.16-1.18	6 1/2 / 6 3/4
Acid.....	1.18-1.22	7 1/2 / 7 3/4
Shoe		
Standard.....	1.56-1.60	7 / 7 1/4
Tubes		
Black.....	1.14-1.26	11 1/4 / 11 1/2
Gray.....	1.15-1.26	12 1/2 / 13 1/4
Red.....	1.15-1.32	12 / 12 1/4
Miscellaneous		
Mechanical blends.....	1.25-1.50	4 1/2 / 5 1/2
White.....	1.35-1.50	13 1/2 / 14 1/2

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

RUBBER SCRAP

SOME increase in the volume of scrap flowing to the dealer agents of the Rubber Reserve Co. is reported because some of the tires in excess of the five allowed passenger-car owners by the OPA announcement of October 15 have found their way into the scrap pile. Because of objections of the reclaimers, Amendment No. 3 to Revised Price Schedule 87 (Scrap Rubber) will not become effective until about April. This amendment raised ceiling prices on most grades of scrap rubber by quite considerable amounts. Prices given below are those currently in use:

Maximum Prices at Consuming Centers*

Inner Tubes†	¢ per lb.
No. 2 passenger tubes.....	7 3/4
Red passenger tubes.....	7 1/2
Passenger tubes.....	6
Tires‡	\$ per Short Ton
Mixed passenger tires.....	30.00
Beadless passenger tires.....	38.00
Solid tires.....	34.00
Peelings†	
No. 1 peelings.....	75.00
No. 2 peelings.....	47.50
No. 1 light colored (zinc) carcass.....	82.50
Miscellaneous Items‡	
Air brake hose.....	25.00
Miscellaneous hose.....	17.00
Rubber boots and shoes.....	33.00
Black mechanical scrap above 1.15 sp. gr.....	20.00
General household and industrial scrap.....	15.00

* For a complete list of revised ceiling prices see our next issue.

† All consuming centers except Los Angeles.

‡ Akron only.

§ All consuming centers.

Rims Approved and Branded by The Tire & Rim Association

Rim Size	Nov. 1942
15" & 16" D. C. Passenger	
16x4.00E.....	2.028
16x4.25E.....	3.099
15x5.00E.....	2.38
16x5.00E.....	3.090
15x5.50F.....	691
16x5.50F.....	4.404
17" & over D. C. Passenger	
18x2.15B.....	6.028
18x3.62F.....	810
Military	
16x4.50CE.....	98.526
16x6.50CN.....	63.244
20x4.50CR.....	4.832
20x6.00CT.....	10.198
20x10.00CW.....	1.583
Flat Base Truck	
20x4.43R (6").....	3.379
15x5.00S (7").....	5.132
20x5.00S (7").....	201.852
24x5.00S (7").....	58
15x6.00T (8").....	2.192
20x6.00T (8").....	37.677
22x6.00T (8").....	9.736
18x7.33V (9 10").....	2.906
20x7.33V (9 10").....	20.383
24x7.33V (9 10").....	2.356
20x8.37V (11").....	683
24x8.37V (11").....	79
Tractor & Implement	
12x2.50C.....	1.370
18x5.50F.....	147
24x8.00T.....	939
Cast	
24x10.00.....	18
24x15.00.....	58
Total.....	487.336

Fel-Pro "Thiokol"

ANEW product that may be utilized to replace crude rubber in gaskets, strips, on Army vehicles as tailgate molding, and for numerous other industrial applications is manufactured by the application by special methods of "Thiokol" to a specially processed felt base. The result is a material having a spongy rubber cushioning effect. One of the problems solved in engineering this new material was that of making it weather resistant. It is produced in the form of strips and may be had in lengths that are well over six feet.

Fel-Pro "Thiokol" is the result of months of intensive development work and testing in the laboratory and in actual use by engineers of the Felt Products Mfg. Co. The resultant product is very satisfactory for those applications which require a spongy type rubber strip.

The manufacturer states that he is in a position to make delivery of considerable quantities of this new "Thiokol" stripping material within reasonable time limits.

Progress Report No. 1

(Continued from page 401)

and others developed by OPC, for use in making synthetic rubber and rubber substitutes. Particularly are they entrusted with the encouragement of and study of the piloting of proposed methods for making butadiene from alcohol or other chemicals made by the fermenting of grains.

The small but highly trained staff of this group include outstanding chemical engineers from faculties of leading educational institutions. These men also serve as Staff Consultants to me and my Deputy Director.

Conclusions

In conclusion I present the following: (1) The Office of the Rubber Director has been organized and is, at least partially, staffed at every appropriate point with thoroughly competent, outstanding personnel who bring to it broad scientific and engineering trainings and an invaluable knowledge and experience of the rubber industry.

(2) The recommendations of the Baruch Committee have been accepted as the basic policy of the Rubber Director. Many of the proposed moves are nearing completion.

(3) The construction program is behind that envisioned by the Baruch Committee, but if it were possible to settle questions of relative importance between programs, it should still be possible to obtain an even flow of components and to build the required facilities in time to prevent the inventory of crude rubber and synthetics falling below the disaster dead-line determined by the Committee. Any further delay will make this impossible. Present indications are that, because of other programs, there will be such a delay.

(4) Working relationships have been established with several other sections of the Government to effectuate essential portions of the rubber program.

(5) Serious problems in connection with the work of the Office of Price Administration and the Office of Defense Transportation are to be solved so that the public may have a full understanding of the Rubber Program and help with it.

(6) Serious problems in connection with the work of the Office of Price Administration are to be solved so that all units of industry are given the proper incentive to help develop the use of synthetic rubbers and rubber substitutes.

November 30, 1942.

Fixed Government Prices

Balata†	Price per Lb.
Prime Manaos Black.....	\$0.68 1/2
Surinam Sheet.....	.64
Guayule.....	.17 1/2
Plantation Grades*	
No. 1-X R.S.S. in cases.....	.22 1/2
No. 1 Thin Latex Crepe.....	.23 1/2
No. 2 Thick Latex Crepe.....	.23 1/2
No. 1 Brown Crepe.....	.21 1/2
No. 2 Brown Crepe.....	.21 1/2
No. 2 Amber.....	.21 1/2
No. 3 Amber.....	.21 1/2
Rolled Brown.....	.17 1/2
Synthetic Rubber	
Buna S.....	.50
Neoprene (GN).....	.65

*For a complete list of government prices see our June, 1942, issue, p. 254.

†For complete list see this issue, p. 297.

WE ARE SERVING UNCLE SAM



Operating under the direct control and supervision of the Rubber Reserve Co. — a Federal agency — in the purchase and handling of scrap rubber, we are loaning our experience and organization to the promotion of the war effort and have ceased to operate on our own account for the period of the emergency.

We are honored in having this opportunity to do our part in helping to overcome the rubber shortage.

Serving the Trade since 1868

THE LOEWENTHAL CO.

Buying Agent, Rubber Reserve Company

188 W. RANDOLPH ST.
CHICAGO, ILL.

159 CLEWELL ST.
AKRON, OHIO

COMPOUNDING INGREDIENTS

AS MILITARY requirements increase in demand for many of the materials formerly utilized by the peacetime markets, supplies continue to be placed under allocation orders to meet production capacity. No substantial changes in prices were made in the past month.

BARITES. Demand is increasing as reclaim and synthetic rubber production gets under way in larger volume.

CARBON BLACK. Requests for furnace-type carbon black for rubber compounding were granted in full in December allocation orders. Shipments of carbon black have improved somewhat with the increase in production of reclaim tires. Sales of all types of carbon black reached a new high, with 644,744,000 pounds sold in 1941 compared with 529,774,000 pounds the preceding year.

MICA. Mica is now under allocation control as of December 10 through amendment of a WPB conservation order.

PIGMENTS. Titanium pigments are no longer restricted in use as ordered in General Preference Order M-44, which was revoked December 8, 1942. Adjustments in prices which do not exceed the maximum prices at time of delivery may be made for lithopone and titanium pigments.

RUBBER SOLVENTS. Stocks are adequate and buying is increasing with upward movement in rubber reclamation program. Prices are firm.

RUBBER SUBSTITUTES. Business remains active, but oils are scarce and restrictions on use continue to be made.

SULPHUR. Demand for sodium sulphide is heavy with increased activity in synthetic rubber industry.

ZINC OXIDE. Buying interest is considerably improved as the need in reclaim rubber manufacture increases.

Current Quotations*

Abrasives

Pumicestone, powdered.....lb.	\$0.035	\$0.04
Rottenstone, domestic.....lb.	.025	

Accelerators, Inorganic

Lime, hydrated, L.C.L., New York.....ton	25.00	
Litharge (commercial).....lb.	.09	
Magnesia, calcined, heavy.....lb.		
technical, light.....lb.	.0625	.07

Accelerators, Organic

A-1.....lb.	.28	.33
A-10.....lb.	.36	.42
A-19.....lb.	.52	.65
A-32.....lb.	.60	.70
A-46.....lb.	.50	.57
A-77.....lb.	.42	.55
A-100.....lb.	.42	.55
Accelerator 49.....lb.	.40	.42
808.....lb.	.59	.61
833.....lb.	1.15	1.15
Acrin.....lb.	.65	
Aldehyde ammonia.....lb.	.65	.70
Altax.....lb.	.43	.45
Arazate.....lb.	1.53	
B-J-F.....lb.	.38	.43
Beutene.....lb.	.59	.64
Butasan.....lb.	1.15	
Butazate.....lb.	1.13	
Butyl Eight.....lb.	.97	.99
C-F-B.....lb.	1.95	
Captax.....lb.	.38	.40
D-B-A.....lb.	1.95	

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of all known ingredients. Prices are not guaranteed, and those readers interested should contact suppliers for spot prices.

Delac A.....lb.	\$0.30	\$0.48
O.....lb.	.30	.48
Di-Esterex-N.....lb.	.30	.48
DOTG (Di-ortho tolyguanidine).....lb.	.50	.57
DPG (Diphenylguanidine).....lb.	.44	.46
El-Sixty.....lb.	.35	.36
Ethasan.....lb.	.40	.47
Ethazate.....lb.	1.13	
Ethylideneaniline.....lb.	1.13	
Formaldehyde P.A.C.....lb.	.42	.43
Formaldehyde-para-toluidine.....lb.	.06	.0625
Formaniline.....lb.	.63	.65
Guantal.....lb.	.36	.37
Hepteen.....lb.	.39	.48
Base.....lb.	.34	.39
Hexamethylenetetramine.....lb.	1.25	1.40
U.S.P. Technical.....lb.	.39	
Lead oleate, No. 999.....lb.	.33	
Witco.....lb.	.175	
Ledate.....lb.	.15	
M-B-T.....lb.	1.48	
M-B-T-S.....lb.	.38	.40
Methasan.....lb.	.43	.45
Methazate.....lb.	1.23	
Monex.....lb.	1.23	
Morflex "33".....lb.	1.53	
"55".....lb.	.67	.72
O-X-A-F.....lb.	.96	1.01
Oxynone.....lb.	.38	.43
Para-nitroso-dimethylaniline.....lb.	.77	.90
Pentex.....lb.	.85	
Flour.....lb.	.74	.84
O.....lb.	1.225	1.325
Phenex.....lb.		
Pipazate.....lb.	.49	.54
Pip-Pip.....lb.	1.53	
R & H 50-D.....lb.	1.63	
Rotax.....lb.	.42	.43
Santocure.....lb.	.48	.50
Selenac.....lb.	1.15	1.25
SPDX.....lb.	.60	.67
A.....lb.	1.98	
Super sulphur No. 2.....lb.	.69	.74
Tetrona.....lb.	.013	.015
Thiocarbamide.....lb.	2.20	
Thiofide.....lb.	.28	.33
Thionex.....lb.	.43	.50
Thiotax.....lb.	1.53	
Thiurad.....lb.	.38	.45
Thiuram E.....lb.	1.53	
M.....lb.	1.53	
Trimene.....lb.	.54	.64
Base.....lb.	1.03	1.18
Triphenylguanidine (TPG).....lb.	.45	
Tuads, Methyl.....lb.	1.53	
2-MT.....lb.	.58	.60
Uto.....lb.	.99	1.04
Ureka.....lb.	.50	.57
Blend B.....lb.	.50	.57
C.....lb.	.48	.55
Vulcanex.....lb.	.42	.43
Z-L-N.....lb.	2.45	
Zenite.....lb.	.40	.42
A.....lb.	.45	.47
B.....lb.	.42	.44
Zimate, Butyl.....lb.	1.13	
Ethyl.....lb.	1.13	
Methyl.....lb.	1.23	
Zipacel.....lb.	1.65	

Activators

Aero Ac 50.....lb.	.46	.52
Barak.....lb.	.50	
MODX.....lb.	.295	.345
SL-20.....lb.	.1089	.1135

Age Resisters

AgeRite Alba.....lb.	1.95	2.05
Gel.....lb.	.52	.54
Hipar.....lb.	.61	.63
Powder.....lb.	.43	.45
Resin.....lb.	.43	.45
D.....lb.	.43	.45
White.....lb.	1.33	1.33
Akroflex C.....lb.	.53	.65
Albasan.....lb.	.69	.74
Aminox.....lb.	.48	.57
Antox.....lb.	.54	.56
Betanox.....lb.	.48	.57
B-L-E.....lb.	.48	.57
Powder.....lb.	.64	.73
B-X-A.....lb.	.48	.57
Copper Inhibitor X-87-A.....lb.	1.15	
Flectol H.....lb.	.43	.50
White.....lb.	.89	1.00
M-U-F.....lb.	1.48	
Neozone (standard).....lb.	.61	.63
A.....lb.	.43	.45
C.....lb.	.43	.55
D.....lb.	.43	.45
Distilled.....lb.	.60	.64
E.....lb.	.61	.63
Oxynone.....lb.	.77	.90
Permalux.....lb.	1.18	1.20
Santoflex B.....lb.	.43	.50
BX.....lb.	.54	.61
Santovar A.....lb.	1.15	1.40
Stabilite.....lb.	.48	.69
Alba.....lb.	.50	.74

Thermoflex A.....lb.	\$0.61	/\$0.63
C.....lb.	.34	.56
Tyconite.....lb.	.16	.165
V-G-B.....lb.	.48	.57

Alkalies

Caustic soda, flake, Columbia (400-lb. drums).....100 lbs.	2.70	3.55
liquid, 50%.....100 lbs.	1.95	
solid (700-lb. drums).....100 lbs.	2.30	3.15

Antiscorch Materials

Antiscorch T.....lb.	.90	
Cumar RH.....lb.	1.05	
E-S-E-N.....lb.	.34	.39
R-17 Resin (drums).....lb.	1.075	
RM.....lb.	1.25	
Retarder W.....lb.	.36	
Retardex.....lb.	.445	.475
U-T-B.....lb.	.34	.39

Antisun Materials

Heliozone.....lb.	.23	.24
S.C.R.....lb.	.32	.34
Sunproof.....lb.	.2275	.2775
Jr.....lb.	.165	.215

Blowing Agents

Ammonium Carbonate, lumps (500-lb. drums).....lb.	.0825	
Unicel.....lb.	.50	

Brake Lining Saturant

B.R.T. No. 3.....lb.	.0175	.0185
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Colors

Black

Du Pont powder.....lb.	.42	
Lampblack (commercial), L.C.L.....lb.	.15	

Blue

Du Pont Dispersed.....lb.	.35	.95
Powders.....lb.	2.25	3.75
Heliglon BKA.....lb.	.98	
Toners.....lb.	1.00	

Brown

Mapico.....lb.	.1135	
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Green

Chrome.....lb.	.25	
oxide (freight allowed).....lb.	.24	
Du Pont Dispersed.....lb.	.98	2.85
Powders.....lb.	1.00	
Guignet's (bbls.).....lb.	.70	
Toners.....lb.		

Orange

Du Pont Dispersed.....lb.	.88	2.35
Powders.....lb.	2.75	3.05
Toners.....lb.		

Orchid

Toners.....lb.		
----------------	--	--

Pink

Toners.....lb.		
----------------	--	--

Purple

Toners.....lb.		
----------------	--	--

Red

Antimony.....lb.		
Crimson, 15/17%.....lb.		
R. M. P. No. 3.....lb.	.48	
Sulphur free.....lb.		
R.M.P.....lb.	.52	
Golden 15/17%.....lb.		
Z-A.....lb.	.37	
Z-2.....lb.	.23	
Cadmium, light (400-lb. bbls.).....lb.	.80	.85
Du Pont Dispersed.....lb.	.93	2.05
Powders.....lb.	.60	1.65
Iron Oxide, L.C.L.....lb.		
Mapico.....lb.	.096	
Rub-er-Red (bbls.).....lb.	.0975	
Toners.....lb.		

White

Lithopone (bags).....lb.	.0425	.045
Albalith.....lb.	.0425	.045
Astrolith (50-lb. bags).....lb.	.0425	.045
Azolith.....lb.	.0425	.045
Titanium Pigments.....lb.		
Ray-bar.....lb.	.055	.065
Ray-cal.....lb.	.0525	.0625
Rayox.....lb.	.135	.165
Titanolith (50-lb. bags).....lb.	.056	.0585
Titanox-A.....lb.	.145	.175
B.....lb.	.0575	.0625
30.....lb.	.0575	.0625
C.....lb.	.055	.06
RC.....lb.	.055	.06
RC-HT.....lb.	.055	.06
Ti-Tone.....lb.		
Zopaque (50-lb. bags).....lb.	.145	.1525
Zinc Oxide.....lb.		
Azo ZZZ-11.....lb.	.0725	.075
44.....lb.	.0725	.075
55.....lb.	.0725	.075
French Process, Florence.....lb.	.095	.0975
Green Seal-8.....lb.	.09	.0925
Red Seal-9.....lb.	.085	.0875
White Seal-7.....lb.	.095	.0975
Kadox, Black Label-15.....lb.	.0725	.075
No. 25.....lb.	.085	.0875
72.....lb.	.0725	.075
Red Label-17.....lb.	.0725	.075

Horse Head Special 3.	lb.	\$0.0725 / \$0.075
XX Red-4.	lb.	.0725 / .075
23.	lb.	.0725 / .075
72.	lb.	.0725 / .075
78.	lb.	.0725 / .075
80.	lb.	.0725 / .075
103.	lb.	.0725 / .075
110.	lb.	.0725 / .075
St. Joe (lead free)		
Black Label.	lb.	.0725 / .075
Green Label.	lb.	.0725 / .075
Red Label.	lb.	.0725 / .075
U.S.P.	lb.	.105 / .1075
Zinc Sulphide Pigments		
Cryptone-BA-19.	lb.	.056 / .0585
BT.	lb.	.056 / .0585
CB.	lb.	.056 / .0585
MS.	lb.	.0575 / .06
ZS No. 20.	lb.	.0825 / .085
86.	lb.	.0825 / .085
230.	lb.	.0825 / .085
800.	lb.	.0825 / .085
Sunolith.	lb.	.0425 / .045
Yellow		
Canolith (cadmium yellow).	lb.	.55 / .60
Du Pont Dispersed.	lb.	1.25 / 1.85
Powders.	lb.	.70 / 1.75
Mapico.	lb.	.071
Toners.	lb.	
Dispersing Agents		
Bardex.	lb.	.0425 / .045
Bardol.	lb.	.025 / .0275
B.	lb.	.05 / .0525
Darvan No. 1.	lb.	.30 / .34
No. 2.	lb.	.30 / .34
No. 3.	lb.	.30 / .34
Nevoll (drums, c.l.).	lb.	.0225
Santomer S.	lb.	.11 / .25
Extenders		
Extendex C.	lb.	
Naftolen.	lb.	.15 / .20
"600" S.	lb.	.14 / .16
Vanzak.	gal.	.05 / .06
Fillers, Inert		
Asbestine, c.l.	ton	20.00
Asbestos Fiber.	ton	15.50 / 48.00
Barytes.	ton	40.00
f.o.b., St. Louis (50 lb. paper bags)	ton	25.55
off color, domestic.	ton	29.00
white, domestic.	ton	38.50
Blanc fixe, dry, precip.	ton	80.00
Calcene.	ton	37.50 / 43.00
Infusorial earth.	lb.	.0225
Kalite No. 1.	ton	26.00
3.	ton	36.00
Kalvan.	ton	100.00
Magnesium Carbonate, l.c.l.	lb.	.0725
Paradene No. 2 (drums).	lb.	.0525
Pyrex A.	ton	7.50
Whiting		
Columbia Filler.	ton	9.00 / 14.00
Suprex White.	ton	32.50
Witco, c.l.	ton	8.00
Witcarb.	lb.	
Finishes		
Black-Out (surface protec- tive).	gal.	4.50 / 5.00
Mica, l.c.l.	lb.	0.45 / .05
Rubber lacquer, clear.	gal.	1.00 / 2.00
colored.	gal.	2.00 / 3.50
Shoe varnish.	gal.	1.45
Talc.	ton	25.00
Flock		
Cotton flock, dark.	lb.	.09 / .10
died.	lb.	.40 / .80
white.	lb.	.12 / .18
Rayon flock, colored.	lb.	1.00 / 1.50
white.	lb.	.75 / 1.00
Latex Compounding Ingredients		
Accelerator 352.	lb.	4.63
Aerosol OT Aqueous 10%.	lb.	1.25
Antox, dispersed.	lb.	.84
Aquax D.	lb.	.75
F.	lb.	.85
MDL Paste.	lb.	.25
Areskap No. 50.	lb.	.18 / .24
100, dry.	lb.	.39 / .51
Aresket No. 240.	lb.	.16 / .22
300, dry.	lb.	.42 / .50
Aresklene No. 375.	lb.	.35 / .50
400 dry.	lb.	.51 / .65
Black No. 25, dispersed.	lb.	.22 / .40
Casein, muriatic 30 mesh.	lb.	.215
Collocarb.	lb.	.07
Color Paste, dispersed.	lb.	.75 / 1.10
Copper Inhibitor X-872.	lb.	2.25
Dispersex No. 15.	lb.	.11 / .12
No. 20.	lb.	.08 / .10
Factex Dispersion A.	lb.	.17
Heliozone, dispersed.	lb.	.25
MICRONEX, Colloidal.	lb.	.06
R-2 Crystals.	lb.	1.55
S-1 (400-lb. drums).	lb.	.65
Santobrite Briquettes.	lb.	
Powder.	lb.	
Santomer D.	lb.	.41 / .65
S.	lb.	.11 / .25
Sodium Stearate.	lb.	.40
Stablex A.	lb.	.90 / 1.10
B.	lb.	.70 / .95
C.	lb.	.40 / .50

Sulphur, dispersed.	lb.	\$0.10 / \$0.15
No. 2.	lb.	.08 / .12
T-1 (440-lb. drums).	lb.	.40
Tepidone.	lb.	.63
Tetrone A.	lb.	2.20
Tysonite, dispersed.	lb.	.32 / .35
Zenite Special.	lb.	.47
Zinc oxide, dispersed.	lb.	.12 / .15
Mineral Rubber		
Black Diamond, l.c.l.	ton	25.00 / 30.00
B.R.C. No. 20.	lb.	.0105 / .0115
Hydrocarbon, Hard.	lb.	25.00 / 27.00
MilliMar.	lb.	.055
Parmr.	ton	
Pioneer, c.l.	lb.	25.00 / 27.00
285°-300°.	ton	25.00 / 27.00
Mold Lubricants		
Aluminum Stearate.	lb.	.23 / .24
Aquax D.	lb.	.75
MDL Paste.	lb.	.25
Colite.	gal.	.90 / 1.15
Lubrex.	lb.	.25 / .30
Mold Paste.	lb.	.12 / .30
Rubber-Glo, conc. regular.	gal.	.94 / 1.15
Type W.	gal.	.99 / 1.20
Sericite.	ton	65.00
Soapstone, l.c.l.	ton	22.60
Zinc Stearate.	lb.	.29 / .31
Oil Resist		
A-X-F.	lb.	.82 / .85
Reclaiming Oils		
B.R.V.	lb.	.035 / .0375
C-10.	gal.	.19 / .24
D-4.	gal.	.17 / .22
E-5.	gal.	.15 / .20
No. 1621.	lb.	.021 / .0235
S.R.O.	lb.	.02 / .0225
X-443.	gal.	.29
Reinforcers		
Carbon Black		
Aerfloted Arrow Specifica- tion (bags only).	lb.	.0355†
Arroene Compact Granu- lized.	lb.	.0355†
Certified Heavy Com- pressed (bags only).	lb.	.0355†
Spheron.	lb.	.0355†
Channel "S".	lb.	.12
Continental, dustless.	lb.	.0355†
"AA"	lb.	.0355†
Compressed (bags only).	lb.	.0355†
Disperso.	lb.	.0355†
Dixie.	lb.	.0355†
Dixiedensed.	lb.	.0355†
66.	lb.	.0355†
Furnex.	lb.	.035
Beads.	lb.	.035
Gastex.	lb.	.035 / .06
HN.	lb.	.0355†
Kosmobile.	lb.	.0355†
66.	lb.	.0355†
77.	lb.	.0355†
S.	lb.	.0355†
Kosmos.	lb.	.0355†
Dixie 20.	lb.	.0355†
MICRONEX Beads.	lb.	.0355
Hi-Tear.	lb.	.0355
Mark II.	lb.	.0355
Standard.	lb.	.0355
W-5.	lb.	.0355
W-6.	lb.	.0355
P-33.	lb.	.0475
Pelletex.	lb.	.035 / .06
Spheron "S" (bags).	lb.	.0455†
"S" (bags).	lb.	.15
T (bags).	lb.	.09
Statex.	lb.	
Thermax.	lb.	.0225
"S".	lb.	.0675
TN.	lb.	.0355†
Velvetex.	lb.	
"WYEX BLACK".	lb.	.0355†
Carbonex Flakes.	lb.	.03 / .035
S.	lb.	.031 / .036
Plastic.	lb.	.051 / .0335
Clays		
Aerfloted Hi-White.	ton	10.00
LGB.	ton	15.00
Paragon (50-lb. bags).	ton	10.00
Suprex (50-lb. bags).	ton	10.00
Catalpo, c.l.	ton	30.00 / 23.50
China.	ton	25.00
Dixie.	ton	10.00 / 22.50
"L".	ton	21.00
Langford.	ton	8.50
McNamee.	ton	10.00
Par.	ton	10.00
Paraforce, c.l.	ton	50.00
Witco, c.l.	ton	10.00
Cumar EX.	lb.	.05
MH.	lb.	.065 / .115
V.	lb.	.095 / .125
465 Resin.	lb.	
"G" Resin.	lb.	
Nevindene.	lb.	
Silene.	ton	80.00 / 90.00
Reodorants		
Amora A.	lb.	
B.	lb.	
C.	lb.	
D.	lb.	

†Price quoted is f.o.b. works (bags). The price f.o.b. works (bulk) is \$0.033 per pound. All prices are carlot.

Curodex 19.	lb.	
188.	lb.	
198.	lb.	
Rodo No. 0.	lb.	\$4.00 / \$4.50
10.	lb.	5.00 / 5.50
Rubber Substitutes		
Black.	lb.	.085 / .13
Brown.	lb.	.085 / .1375
White.	lb.	.09 / .15
Factice		
Amberex Type B.	lb.	.1875
Brown.	lb.	.085 / .1375
Fac-Cel B.	lb.	.15
C.	lb.	.15
Neophax A.	lb.	.165
B.	lb.	.165
White.	lb.	.09 / .15
Softeners and Plasticizers		
Amidex.	lb.	
B.R.T. No. 7.	lb.	.02 / .021
Bondogen.	lb.	.98 / 1.05
Bunnatol (for synthetic rubber).	lb.	
G.	lb.	.40 / .50
S.	lb.	.40 / .50
Burgundy pitch.	lb.	
Copene Resin.	lb.	.32
Cyclone oil.	gal.	.14 / .20
Dipolymer Oil.	gal.	.33 / .38
Dispersing Oil No. 10.	lb.	.0375 / .04
I.M.-Nypene (drums).	lb.	.25
LX-436 (tank car).	lb.	.027
Myristilene.	lb.	.20 / .30
Nevinol.	lb.	.13 / .14
Nuba resinous pitch (drums)		
Grades No. 1 and No. 2.	lb.	.029
3-X.	lb.	.0425
Nypene Resin.	lb.	.32
Palm oil (Witco), c.l.	lb.	
Palmalene.	lb.	.15 / .25
Palmol.	lb.	.16
Para Flux (reg.).	gal.	.17 / .18
No. 2016.	gal.	.135 / .19
Para Lube.	lb.	.046 / .048
Paradene No. 1 (drums)	lb.	.0525
Special (drums)		
20 to 35° C. M.P.	lb.	.0625
35 to 45° C. M.P.	lb.	.0625
45 to 75° C. M.P.	lb.	.0575
Pectizene.	lb.	.65
Piccolizer "30".	lb.	
Piccolyte Resins.	lb.	.147 / .185
Piccomaron Resins.	lb.	.043 / .08
Pictar.	gal.	.18 / .23
Pine tar.	gal.	
Oil.	gal.	.42
Plasticizer B.	lb.	.35 / .45
Plastogen.	lb.	.0775 / .08
Plastone.	lb.	.27 / .30
R-19 Resin (drums).	lb.	.1075
21 Resin (drums).	lb.	.1075
Reogen.	lb.	.115 / .12
RPA No. 1E.	lb.	.55
2.	lb.	.65
3.	lb.	.46
4.	lb.	.80
Tackol.	lb.	.085 / .18
Tarzac.	lb.	.23 / .24
Tonox.	lb.	.50 / .59
Witco No. 20, l.c.l.	gal.	.20
X-1 resinous oil (tank car).	lb.	.011
XX-100 Resin.	lb.	.0525
Softeners for Hard Rubber Compounding		
Resin C Pitch 45° C. M.P.	lb.	.015 / .016
60° C. M.P.	lb.	.015 / .016
75° C. M.P.	lb.	.015 / .016
Solvents		
Beta-Trichlorethane.	lb.	.20
Carbon Bisulphide.	100 lbs.	5.75
Tetrachloride.	gal.	.80
Cosol No. 1.	gal.	.26
No. 2.	gal.	.25
No. 3.	gal.	.22
Industrial 90% benzol (tank car).	gal.	.15
Picco.	gal.	.22 / .32
Skellysolve.	gal.	
Stabilizers for Cure		
Barium Stearate.	lb.	.29 / .32
Calcium Stearate.	lb.	.26 / .27
Laurex (bags).	lb.	.1475 / .1725
Lead Stearate.	lb.	
Magnesium Stearate.	lb.	.31 / .32
Stearex B.	lb.	
Beads.	lb.	
Stearic acid, single pressed.	lb.	
Stearite, c.l.	lb.	.1325
Zinc Laurate.	lb.	.29 / .32
Stearate.	lb.	.31
Synthetic Rubber		
Neoprene Latex Type 571.	lb.	.30
60.	lb.	.30
Neoprene Type CG.	lb.	.70
FR.	lb.	.65
G.	lb.	.75
GN.	lb.	.70
ILS.	lb.	.65
KNR.	lb.	.75
M.	lb.	.65
Synthetic 100.	lb.	.41

"Thiokol" Type "A".....lb.	\$0.35
"FA".....lb.	.50
"RD".....lb.	.70

Tackifier

B.R.H. No. 2.....lb.	.02	/\$0.021
LX-433 (tank car).....lb.	.068	
P.H.O. (drums).....lb.	.24	

Vulcanizing Ingredients

Magnesia, light (for neoprene).....lb.	.25	/.26
Sulphur.....100 lbs.	2.05	
Chloride (drums).....lb.	.04	
Telloy.....lb.	1.75	
Thiogen 6.....lb.	.18	.25
10.....lb.	.18	.25
Vandex.....lb.	1.75	

(See also Colors—Antimony)

Waxes

736 (clear).....gal.	1.25	
737 (black).....gal.	1.35	
1515-A (black).....gal.	1.35	
Carnauba, No. 3 chalky.....lb.	.7175	
2 N.C.....lb.	.7575	
3 N.C.....lb.	.735	
1 Yellow.....lb.	.8325	
2.....lb.	.8125	
Carnauba.....lb.	.49	/.59
Monten.....lb.	.12	/.17
Rubber Wax No. 118.....lb.		
Neutral.....gal.	.76	1.31
Colors.....gal.	.86	1.41

UNCLASSIFIED

(Continued from page 404)

Plural-Chambered Safety Tube. P. J. Truscott, now by judicial change of name J. P. Truscott, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.
2,302,475. Hose Clamp. R. Richards, Chicago, Ill.

United Kingdom

348,165. Tire Connectors. W. Turner.
348,787. Couplings of Pneumatic Tire Pressure Gages. B. Walters.

TRADE MARKS**United States**

398,471. Sporttime. Corsets. I. B. Kleinert Rubber Co., New York, N. Y.
398,551. Dash. Prophylactics. Julius Schmid, Inc., New York, N. Y.
398,552. Lynx. Prophylactics. Julius Schmid, Inc., New York, N. Y.

Inc., New York, N. Y.
398,688. Quixam. Gloves. Pioneer Rubber Co., Willard, O.
398,689. Duron. Chlorine-containing rubber compounds. Firestone Tire & Rubber Co., Akron, O.
398,696. Hi-Tear. Carbon black. Binney & Smith Co., New York, N. Y.
398,707. Zeroflex. All forms of compound made of natural and synthetic rubber. Rubbercraft Corp., Ltd., Los Angeles, Calif.
398,751. Redi-Wet. Prophylactics. Dean Rubber Mfg. Co., North Kansas City, Mo.
398,744. Representation of a label containing the word: "Pharis." Lubricating Oil. Pharis Tire & Rubber Co., Newark, O.
398,849. Representation of a label with the word: "Pharis." Rubber cement, automobile gasket, rim cement and friction tape. Pharis Tire & Rubber Co., Newark, O.
398,944. Representation of an airplane between the words: "Regal Mainliner." Tires and tubes. Strauss Stores Corp., Maspeth, L. I., N. Y.
398,962. Nylotte. Girdles and brassieres. Kops Bros., New York, N. Y.
398,986. Zipper. Heels and soles. Tailorbrook Clothes, Inc., New York, N. Y.
399,020 and 399,021. Representation of a rectangle of dashes surrounding the letters: "H. C. T. S." Rubber, hides, and skins. Holland-Colombo Trading Society, Inc., Dover, Del.
399,050. War Scrappers. Scrap and junk of paper, metal, rubber, rag, waste, and fat scrap. M. Nemetz, Brooklyn, N. Y.
399,060. Representation of a label containing the word: "Pharis." Automobile seat covers. Pharis Tire & Rubber Co., Newark, O.

Tire and Tube Quotas for January 1943*

UNITED STATES AND TERRITORIES		PASSENGER AND MOTORCYCLE, ETC.				TRUCK AND BUS, ETC.			FARM TRACTOR AND IMPLEMENT
Region		New Grade I Tires	New Grade II Tires	Grade III Tires	Recapping Services	Tubes	Tires	Recapping Services	Tubes
No. 1	Maine.....	821	1,523	4,065	4,999	4,298	2,570	3,181	2,707
	New Hampshire.....	504	994	2,566	3,222	2,745	1,172	2,027	1,506
	Vermont.....	385	586	1,867	2,041	1,833	1,000	1,050	965
	Massachusetts.....	4,355	6,668	20,236	23,317	20,531	6,410	6,119	5,898
	Rhode Island.....	863	1,295	4,053	4,587	4,059	1,270	1,279	1,200
	Connecticut.....	2,109	4,471	12,004	14,711	12,503	4,576	5,056	4,534
Boston	Sub-total.....	9,037	15,537	44,791	52,877	45,969	15,918	18,712	16,810
No. 2	New York State.....	16,068	15,913	52,950	58,654	54,478	19,572	17,018	17,224
	New Jersey.....	4,654	6,875	22,926	24,713	22,194	7,320	7,376	6,918
	Pennsylvania.....	9,892	18,828	49,751	62,514	53,075	19,228	21,957	19,387
	Delaware.....	397	619	1,597	2,017	1,754	813	990	849
	Maryland.....	3,886	5,522	11,774	16,915	14,597	5,823	5,305	5,238
	District of Columbia.....	3,149	1,224	3,580	5,298	5,249	1,223	1,291	1,183
New York	Sub-total.....	38,046	48,981	142,578	170,111	151,347	53,979	53,937	50,799
No. 3	Ohio.....	8,321	15,124	43,126	5,879	44,091	15,918	16,007	15,028
	Kentucky.....	4,094	10,379	13,265	11,410	11,410	5,549	8,487	6,607
	West Virginia.....	1,533	2,972	6,699	9,251	7,754	4,308	6,547	5,110
	Michigan.....	7,277	10,411	36,572	38,014	34,565	12,502	9,378	10,299
	Indiana.....	4,115	7,899	19,551	25,493	21,541	10,477	11,172	10,191
Cleveland	Sub-total.....	23,733	40,400	116,227	136,902	119,361	48,754	51,591	47,235
No. 4	Virginia.....	3,289	5,358	12,594	17,303	14,634	8,214	11,434	9,249
	North Carolina.....	3,665	5,334	13,976	18,242	15,611	10,129	15,943	12,273
	South Carolina.....	2,399	2,853	7,742	9,627	8,616	4,011	5,769	4,604
	Georgia.....	3,313	4,394	11,705	14,551	12,909	8,088	12,472	9,678
	Florida.....	2,868	3,643	10,664	12,579	11,271	7,635	10,079	8,338
	Tennessee.....	2,608	4,022	10,167	13,064	11,326	7,426	10,456	8,417
	Alabama.....	2,647	4,035	8,987	13,144	10,973	6,445	9,937	7,711
	Mississippi.....	1,713	1,976	5,268	6,679	5,964	5,754	6,511	5,773
Atlanta	Sub-total.....	22,502	31,615	81,103	105,189	91,304	57,702	82,601	66,043
No. 5	Missouri.....	4,749	5,657	18,509	20,280	18,580	10,321	12,135	10,571
	Kansas.....	2,559	3,546	11,775	12,681	11,486	7,494	7,452	7,035
	Oklahoma.....	3,199	3,809	11,308	13,322	11,998	8,014	7,459	7,284
	Arkansas.....	1,402	1,797	5,026	6,716	5,650	5,479	7,059	5,902
	Texas.....	9,450	10,105	31,211	35,581	32,811	26,100	23,396	23,299
	Louisiana.....	2,401	2,479	8,170	8,963	8,348	6,490	5,151	5,480
Dallas	Sub-total.....	23,760	27,393	86,002	97,543	88,873	63,898	62,652	59,571
No. 6	Illinois excl. Met. Chicago.....	4,209	7,119	22,215	24,727	21,873	11,450	7,131	8,746
	Met. Chicago.....	4,718	5,147	19,550	20,056	18,591	7,332	5,669	6,120
	Iowa.....	3,114	4,231	15,596	15,894	14,532	7,195	4,755	5,625
	Nebraska.....	1,646	2,045	7,062	7,514	6,872	5,235	3,592	4,155
	North Dakota.....	659	839	3,219	3,166	2,951	1,982	1,054	1,429
	South Dakota.....	686	1,000	3,570	3,642	3,330	2,318	1,876	1,955
	Minnesota.....	3,248	4,163	16,961	16,105	15,109	5,648	4,011	4,547
	Wisconsin.....	3,280	4,924	17,781	18,165	16,498	5,439	5,559	5,177
Chicago	Sub-total.....	21,560	29,468	105,954	109,339	99,756	46,599	33,607	37,754
No. 7	Montana.....	768	956	3,102	3,405	3,106	2,852	2,923	2,718
	Idaho.....	944	1,009	3,000	3,419	3,191	2,462	3,229	2,679
	Wyoming.....	369	474	1,535	1,668	1,526	1,460	1,294	1,296
	Colorado.....	1,759	2,378	7,808	8,697	7,760	5,003	4,152	4,309
	Utah.....	695	1,314	3,119	4,013	3,464	2,862	2,932	2,727
	New Mexico.....	603	663	2,037	2,364	2,151	2,673	2,559	2,463
Denver	Sub-total.....	5,138	6,794	20,601	23,566	21,198	17,312	17,089	16,192
No. 8	Washington.....	2,275	3,974	12,696	14,063	12,352	5,088	5,896	5,170
	Oregon.....	2,077	3,095	8,825	10,451	9,233	7,659	7,803	7,278
	North California.....	4,997	8,786	27,088	30,585	26,780	11,560	17,104	13,493
	Southern California.....	6,134	12,714	39,217	44,223	38,199	9,255	12,502	10,241
	Nevada.....	223	332	980	1,316	1,069	1,279	1,040	1,092
	Arizona.....	750	522	2,473	2,246	2,263	3,610	3,332	3,268
San Francisco	Sub-total.....	16,456	29,423	91,279	102,884	89,896	38,451	47,677	40,542
No. 9	Puerto Rico.....	462	262	978	1,171	1,103	628	326	449
	Virgin Islands.....	40	7	487	418	390	553	8	264
	Canal Zone.....	59	23	115	115	115	406	191	10
	Alaska.....	207	389	1,465	1,589	1,632	1,614	334	917
Washington, D. C.	Sub-total.....	768	389	1,465	1,589	1,632	1,614	334	917
Total U. S. and Territories.....		161,000	230,000	690,000	800,000	709,336	345,307	368,200	335,863
									21,000

*The quotas listed do not include reserves except in the farm tractor and implement quota where the total state quota is listed.

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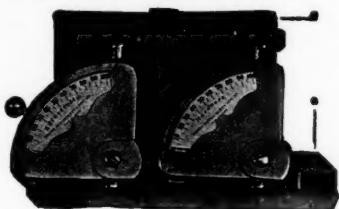
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NEW YORK COTTON EXCHANGE WEEK-END
CLOSING PRICES

	Oct.	Nov.	Dec.	Dec.	Dec.	Dec.
Futures	28	5	12	19	26	
Dec.	18.39	18.60	18.96	19.04		
Mar.	18.50	18.34	18.79	18.78	18.94	19.08
July	18.64	18.10	18.55	18.52	18.74	18.94
Oct.	18.73	18.21	18.48	18.48	18.69	18.88
Dec.				18.66	18.88	

New York Quotations

December 24, 1942

Drills

38-inch 2.00-yard	yd.	2.25
40-inch 1.45-yard	yd.	2.25
50-inch 1.52-yard	yd.	80.29
52-inch 1.85-yard	yd.	2.38
52-inch 1.90-yard	yd.	2.3228
52-inch 2.20-yard	yd.	2.0511
52-inch 2.50-yard	yd.	1.85
59-inch 1.85-yard	yd.	2.5851

Ducks

38-inch 2.00-yard D. F.	yd.	2.11
40-inch 1.45-yard S. F.	yd.	2.29
51 1/2-inch 1.35-yard D. F.	yd.	3.32
72-inch 1.05-yard D. F.	yd.	4.5
72-inch 17-21 ounce	lb.	4.87

Mechanicals

Hose and belting	lb.	42 1/4
------------------	-----	--------

Tennis

51 1/2-inch 1.35-yard	yd.	3.12
51 1/2-inch 1.60-yard	yd.	2.78
51 1/2-inch 1.90-yard	yd.	2.38

Hollands—White

Blue Seal		
20-inch	yd.	1.31
30-inch	yd.	2.41
40-inch	yd.	2.7

Gold Seal

20-inch No. 72	yd.	1.41
30-inch No. 72	yd.	2.54
40-inch No. 72	yd.	2.9

Red Seal

20-inch	yd.	1.21
30-inch	yd.	2.2
40-inch	yd.	2.41

Onseburgs

40-inch 2.34-yard	yd.	1.51
40-inch 2.48-yard	yd.	1.45
40-inch 2.56-yard S. F.	yd.	1.4578
40-inch 3.00-yard	yd.	1.24
40-inch 7-ounce part waste	yd.	1.5
40-inch 10-ounce part waste	yd.	2.15
37-inch 2.42-yard clean	yd.	1.51

Raincoat Fabrics

Cotton		
Bombazine 64 x 60	yd.	2.25
Plaids 60 x 48	yd.	1.95
Surface prints 64 x 60	yd.	2.25
Print cloth, 38 1/2-inch, 64 x 60	yd.	0.8971

Sheetings, 40-inch

48 x 48, 2.50-yard	yd.	1.6200
64 x 68, 3.15-yard	yd.	1.1968
56 x 60, 3.60-yard	yd.	1.1544
44 x 40, 4.25-yard	yd.	0.9764

Sheetings, 36-inch

48 x 48, 5.00-yard	yd.	0.8600
44 x 40, 6.15-yard	yd.	0.6991

Tire Fabrics

Builder		
17 1/2 ounce 60" 23/11 ply Karded peeler	lb.	5.31

Chafers

14 ounce 60" 20/8 ply Karded peeler	lb.	5.21
9 1/2 ounce 60" 10/2 ply Karded peeler	lb.	5.21

Cord Fabrics

23 5/8 Karded peeler, 1 1/2" cotton	lb.	5.31
15 3/8 Karded peeler, 1 1/2" cotton	lb.	5.12
12 1/4 Karded peeler, 1 1/2" cotton	lb.	5.21
23 5/8 Karded peeler, 1 1/2" cotton	lb.	5.31

Leno Breaker

8 1/4 ounce and 10 1/4 ounce 60" Karded peeler	lb.	5.31
--	-----	------

beginning of the month, was passed in the House and approved by the Senate Agriculture Committee, but did not receive immediate action in the Senate. With the closing of Congress in the middle of the month, the Pace Bill, which provides for the inclusion of farm labor costs in the parity formula, must now await the convening of the 78th Congress in January when it is hoped the situation will be clarified. Even if the Senate passes the bill, it is expected to be vetoed by the President as it would mean a rise in parity of almost 12.6%, which inflationary move has been definitely opposed by the Administration for some time. The resignation of Price Administrator Leon Henderson and a possible reorganization of the OPA might mean a victory for the farm bloc.

The price of 15/16-inch spot middling grade rose from 20.38¢ a pound on December 4 to 20.74¢ on December 22 and closed at 21.10¢ on January 2.

A committee to investigate the claims of Senator Bankhead of Alabama that New York futures price depresses the price to the grower has been appointed by the New York Cotton Exchange. Amendments to the 1942 C. C. C. Cotton Form 1 include: an increase of 1¢ a pound over the loan rates previously announced for cotton produced in 1942 (Amend. No. 1—1942 C. C. C. Cotton Form 1—Instructions); provision for loans to producers secured by cotton on the 1942 crop stored on farms (Amend. No. 2); the use of certificates of indemnity (Supp. 2); the rules and procedure relating to the purchase or pooling by the Commodity Credit Corp. of the 1942 cotton producers' notes (Amend. No. 1 to Supp. 1); and loans on 1942 farm-stored cotton (Supp. 3). The vote taken by the cotton farmers on the continuance of the federal marketing quotas favored the operation of the program for the 1943-44 season, although some opposition was voiced that all restrictions on crop planting should be eliminated for the duration.

The Crop Reporting Board of the Department of Agriculture forecast a 1942-43 crop at 12,982,000 bales, compared with 13,329,000 estimated a month ago and the 1941 yield of 10,744,000 bales. Consumption during November amounted to 913,058 running bales, against the November, 1941, figure of 849,143 bales. Lend-lease requirements for 1942-43 are not expected to be more than 800,000 bales, compared with a million bales in the past season. The drop in the export figure may have been the result of protests against the foreign demand for the much needed long-staple cottons.

Fabrics

Lend-lease needs for 1943 are expected to take over 900,000,000 square yards, which will cut deeply into the yardage available for essential civilian needs already reduced by our own military requirements. Sheetings used in civilian raincoats are practically unobtainable without a priority rating, and the demand for sheetings by synthetic rubber manufacturers in government work is still beyond the industry's ability to produce. Orders are booked well into the second quarter of 1943. Cotton fabrics for rubber boat goods are reported entering the

fabric market. Plied combed yarns in a basket weave are used, and prices are reported to range above \$1 a yard. A reported tightness in duck yarn delivery is attributed to the recent resumption of production by certain tire fabric spinners of fabric for military tires.

High-tenacity rayon yarn to be used in automobile tire cord has been placed under a ceiling price of 43¢ a pound, authorized by OPA Amendment 3 to Maximum Price Regulation 167. As this price is based on estimated production costs, a revision may be necessary later on, should costs warrant a fairer price. All fabric prices remain unchanged, with the exception of tire fabrics, which continue to rise again another 1/2¢ a pound.

Synthetic Elastic Yarn

AN IMMEDIATE saving of a considerable poundage of rubber in the manufacture of certain types of military equipment has been made possible by the introduction of a new vinyl resin elastic yarn developed in the research laboratories of the American Viscose Corp., it is reported. Currently the entire output of the new product is required. When it becomes possible to supply the yarn for civilian use, however, it can be used to manufacture numerous essential articles of common use that heretofore have been made of rubber.

This new yarn represents an entirely new departure in synthetic textiles and is the type of production on which research men have been working for some time. The elasticity of the new yarn can be adjusted in the manufacturing process so that it represents an elasticity of 150 to 400% of the original length. Tests have shown that the yarn has 100% recovery after having been stretched, it is stated.

The new yarn, as yet unnamed, is a true textile yarn containing a number of parallel filaments rather than being a single mono-filament, as in the case of most extruded latex products. There are a number of advantages to this; some of which appear to be an improved handle to cloth woven of it and also a greater flexibility. The yarn can be covered, in much the same way as latex or other elastic rubber yarns are covered, and in addition it can be used without covering in a great many instances.

The raw material used is from the vinylite family of vinyl resins. Since all vinyl resins are currently under allocation, the use of the new yarn is restricted to military applications and such other uses as would be given high priority ratings.

It is reported that the new yarn has already been used for making a number of articles experimentally and that these products may be manufactured on a commercial basis when supplies of the raw material become available for general use. Articles in which the yarn can replace rubber include elastic webbing, tapes and cords, surgical stockings, knee braces, women's girdles, corsets, and foundation garments, elastic tops for hosiery, supporters and suspenders, bathing suits, and a great many other products which previously have been made with elastic rubber yarns.

SPOT cotton prices rose steadily during December despite uncertainty in trading quarters over the parity formula change program of the farm bloc which, in the



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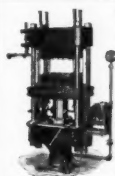
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